SCIENTIFIC AMERICAN

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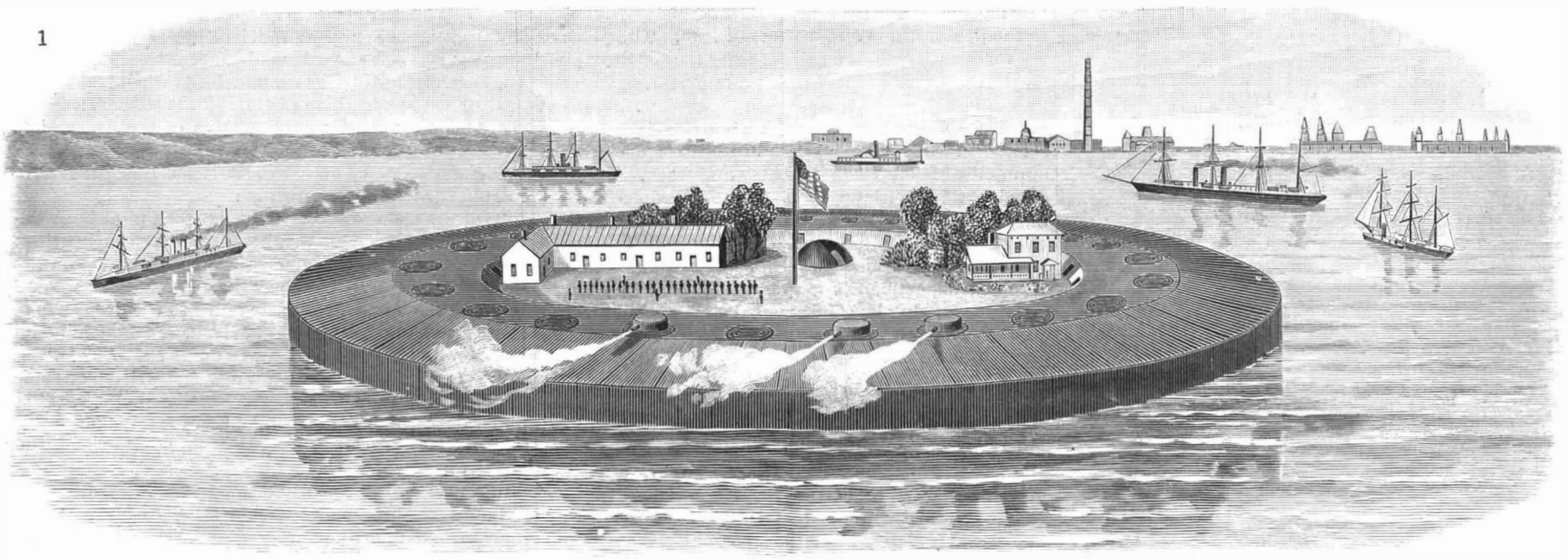

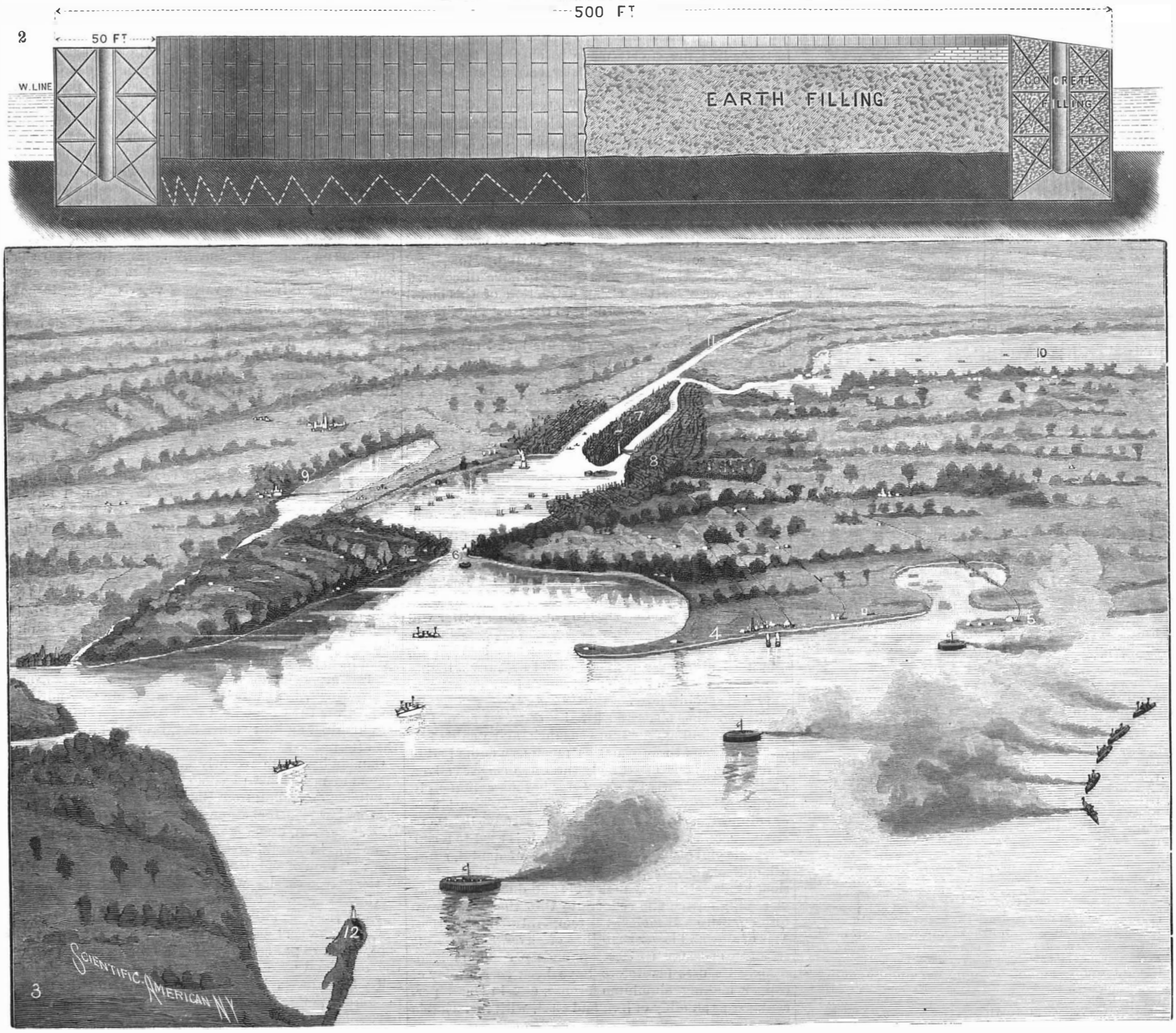

1. A. Anderson fortress. 2. Sectional elevation of the fortress caisson. 3. Bird's eye view of New York harbor and surroundings. 4. Coney Island. 5. Rockaway Beach. 6. The Narrows. 7. New York City. 8. Brooklyn. 9. Newark Bay. 10. Long Island Sound. 11. Hudson River. 12. Sandy Hook.

ANDERSON'S PLAN FOR THE DEFENSE OF NEW YORK.—[See page 356.]

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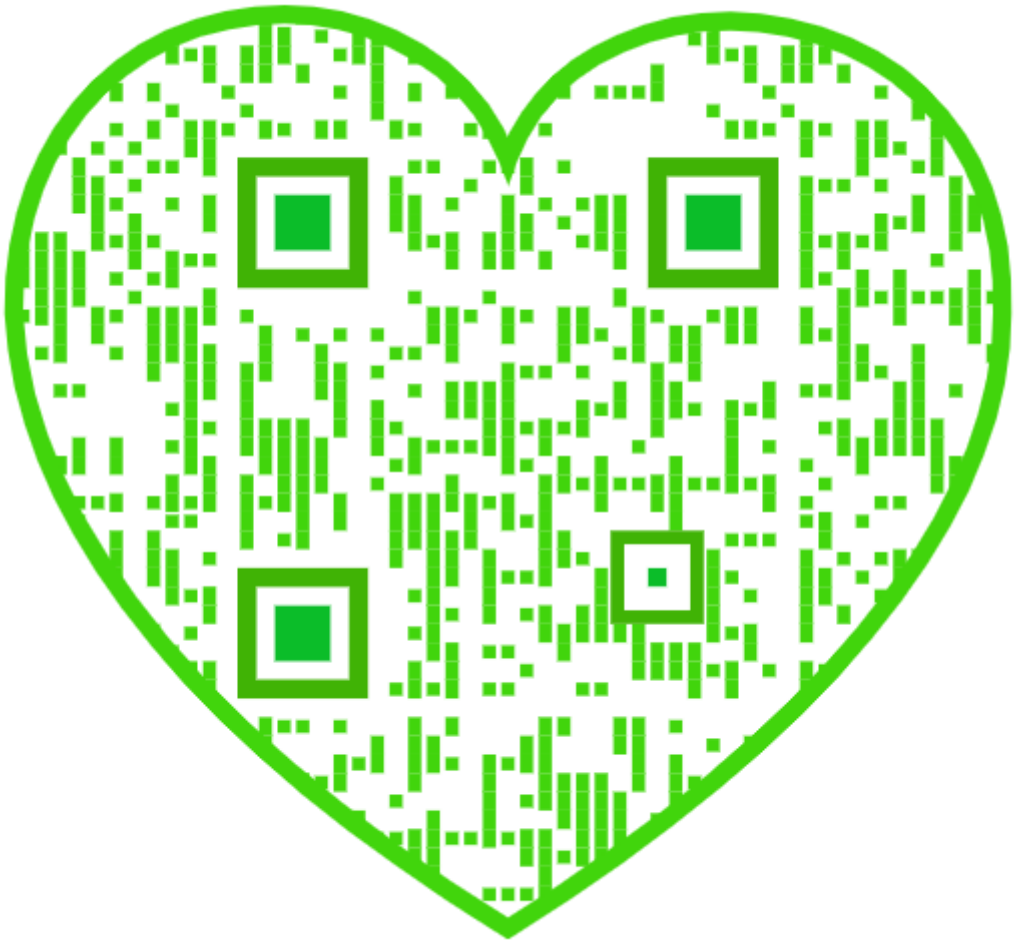

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BIG GUNS FOR COAST DEFENSE.

The chief of the bureau of ordnance, Gen. S. V. Benet, in his recently submitted annual report, notes that a twelve inch breech-loading steel rifle is now nearing completion at the Watervliet Arsenal, and will probably be ready for trial in February. This is the largest size of modern gun we have yet attempted to manufacture, but the Watervliet plant is being put in shape by the government to turn out, also, sixteen inch steel guns. These guns will be fifty feet long and weigh 125 tons each, requiring a full firing charge of 1,000 pounds of powder of the description at present used, and throwing a projectile over a ton in weight. It is expected that these guns will have a maximum range of about fifteen miles, and a muzzle power equal to the penetration of three feet of iron. The plans of the fortifications board call for forty-four of these guns for the defense of ports of the first importance, with the idea of manning our future coast defenses with guns of heavier caliber than are now made for the largest ironclads, and which the highest authorities declare it is impracticable for them to carry and work. The proposed artificial island forts at the entrance to New York harbor, shown in our first page illustration, would afford admirable positions in which to place a few such guns, which, according to the plans of the ordnance department, are to be "mounted in pairs in turrets occupying low and exposed sites, and commanding the principal water approaches" to the port, where they will have "an offensive power commensurate with the importance of the position they will occupy." It is altogether probable, too, that before these guns are completed, or the forts in which they are to be placed will be ready for them, we shall have found and adopted a practicable smokeless powder, affording much greater penetrative force than the explosive agent at present employed, and giving the defense an immense superiority to any means of attack at present known.

PROGRESS OF ALUMINUM.

Since 1885 the efforts made to cheapen the cost of aluminum have been especially earnest among the metallurgists and chemists, both in this country and abroad. In this work Mr. H. Y. Castner, of New York, and Messrs. Cowles, of the Cowles Electric Smelting and Aluminum Company, of Cleveland, O., and Lockport, N. Y., have been especially active, a 500 horse power dynamo having been erected at the latter place for the aluminum manufacture in 1886. And yet so difficult has been its production that five years ago its price was quoted in troy ounces at from 75 cents to $1.25 per ounce, although within the past year or two it has been sold at $3 to $4.50 per pound. Now, however, Mr. Eugene H. Cowles claims to have discovered a new process for the cheap extraction of this metal from common clay. According to the New York *Times* he says:

"We now expect to offer a pure metal made by a new process that is radically different from anything yet known to metallurgists—a process that is ridiculously simple in operation and almost theoretically perfect. By reason of two chemical discoveries it is found that the pure metal can be extracted direct from the clay. This can be done without the use of electrical heat. When operated on as large a scale as that on which iron is produced, aluminum will be produced at a cost permitting it to sell at $200 per ton, a price less than the present price of copper. Alterations will be made immediately in our works at Lockport to make the metal on a large scale. Capitalists in New York are preparing to build immense new works of probably twenty times the capacity of the Lockport works. One of the large plants will undoubtedly be at Niagara Falls, where 10,000 to 12,000 horse power will be required to operate it."

It is to be hoped these expectations will be realized, and if so aluminum is likely soon to occupy a highly important position in the arts, some of which it probably will revolutionize.

The metal has a specific gravity of 2·58, a cubic foot of silver weighing four times as much, and a cubic foot of iron or steel three times as much as a cubic foot of aluminum. It is of sensibly the same color as silver, oxidizes but slightly in air, water has no action on it, nor is it attacked by nitric acid or dilute sulphuric acid or sulphureted hydrogen. From its extreme lightness, strength, and resistance to tarnish, it is used to a considerable extent in the manufacture of dental, surgical, optical, electrical and scientific instruments of various kinds. It is very malleable and ductile, and may be readily beaten and rolled into thin sheets or drawn into fine wire. It melts at a temperature higher than that of zinc and lower than that of silver, has a tensile strength of 25,000 to 30,000 pounds per square inch. Among its uses heretofore have been as an alloy of copper, making aluminum bronze, also in small percentages as an alloy of iron and steel, with remarkable advantages.

THE newest street-cleaning wagon works on the principle of a patent parlor broom—dustless, and gathers up the dirt as it goes.

PIGEONS AS DISPATCH CARRIERS.

The wonderful instinct which leads homing pigeons to return to their cotes, though liberated many miles away, has been taken advantage of by sportsmen and many persons, who enter with great zest into the work of breeding and training these birds and entering them for races. There is a federation of homing pigeon fanciers, consisting of upward of three hundred members. The secretary's office is at Philadelphia, and upon his books is entered a description of each bird belonging to a member of the federation participating in a contest. A piece of metal is attached to the leg of the bird taking part in a race, and upon this is inscribed a mark or number which serves to identify it, should it stray from its course or be driven by wind or storm. The organization of pigeon fanciers has also arranged a series of stations at various distances extending toward the south from New York, and birds when trained are sent by express to these stations, and are there released by a member or a representative of the federation. During the racing season many birds are constantly being started, and occasionally items like the following appear in the daily prints:

"On the last cruise of the New York pilot boat Edmund Blunt, when it was seventy miles southeast of Sandy Hook lightship, a carrier pigeon settled on the foremast rigging. The boat keeper climbed up and brought the almost exhausted bird to the deck, where it was fed and afterward revived. It had a metal band on its leg upon which was engraved 27-29 H."

"A carrier pigeon bearing a message written on some vessel by A. Ross to Mrs. A. Ross, Annapolis, Md., under date June 26, flew on board the schooner Fleur de Lis, Captain Duffy, at 4 P. M., July 11, when the vessel was twenty-seven miles off No Man's Land. The bird appeared to be nearly dead, but recovered."

Such excellent results were attained by the pigeon fanciers, so unerringly did the birds come back to their lofts—only a small proportion of failures occurring—it was not to be wondered at that their marvelous abilities as carriers of messages should have been turned to practical account. During the siege of Paris, 1870-71, pigeons were frequently made use of, and since that date the French government has put forth continuous efforts to develop their use in both the military and naval service. A series of experiments were initiated at Toulon, looking to the introduction of the birds into the naval service. They were conducted by Vice Admiral Bergasse du Petit Thouars and the Societe Forteresse. The first effort was directed toward domesticating the birds on board the St. Louis, the artillery practice ship. Considerable difficulty was experienced from the birds becoming frightened by the guns on board ship, but by rearing them near the guns they soon became accustomed to the sound, and when liberated from the various vessels during target exercise, would form groups above the smoke, sometimes mingling together, but never losing their own ship. France is the only country which has made careful experiments and adopted a system connecting the fleet and the shore. Germany, Austria, Russia, Italy, Spain, and Portugal each has a military pigeon service. Germany has the most complete military system in the world. Lieutenant Richard Wainwright, U. S. N., in speaking of it, says: "The whole of the northern coast is studded with pigeon stations, which are under the control of the minister of marine. Experiments have been made by the German naval authorities on homing pigeons on board men-of-war, so that messages may be sent to the ship from the shore. It is said that the birds experience no difficulty in recognizing their own ship among a number of others."

From 1855 until the laying of the Atlantic cable, homing pigeons were employed to take the news from transatlantic steamers to the Sandy Hook telegraph stations to be transmitted to New York. A bird liberated from the steamer Waesland at one o'clock in the afternoon, when three hundred and fifteen miles from Sandy Hook, was at its loft in the evening. Another let go from the Circassia at nine in the morning, when two hundred and fifty miles out, brought a message in the afternoon.

Canada has quite recently established an organized system of messenger pigeon stations throughout the dominion, extending from Halifax to Windsor and connecting her principal seaports with the interior. Gen. D. R. Cameron, director of the Messenger Pigeon Association, in speaking of the utility of the service, says: "I am of opinion that a most important branch of the pigeon service will be connected with the coast service. The evidence that these birds can be relied upon to cross 400 miles of the ocean is apparently thoroughly reliable." A report from Halifax states that it is proposed to put Sable Island in communication with the mainland by means of carrier pigeons. This locality has always been regarded as one of the most dangerous points on the coast, and wrecked mariners have sometimes been stranded on the island for weeks without being able to communicate with those who might rescue them.

Efforts are now being made to introduce a carrier pigeon service into the United States navy. Professor

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H. Marion, of the Naval Academy, at Annapolis, has given considerable attention to the subject, and in a communication to the writer, dated October 6, says: "The United States have no organized service yet, but it is to be hoped that it will soon be established, as numerous experiments have proved that homing pigeons can fly several hundred miles at sea—if liberated in the morning of course; that birds can be bred and trained on board ship, that they can be accustomed to the noise of the ships, that they can recognize their own ship among others, that they can be relied upon to carry news from the fleet to the shore and under favorable circumstances from the shore to the fleet and from one vessel to another. A service of carrier pigeons for naval purposes could not be improvised at short notice as the birds would require long and careful training before they would be of any use as bearers of dispatches. In war time serious derangement of plans, loss, and discomfiture may be involved by the absence of previously organized provision for the rapid transmission of news. We, therefore, advocate the speedy establishment of a permanent system of naval messenger pigeon lofts at the principal navy yards and stations along the Atlantic coast."

Some very interesting experiments have already been made with homing pigeons at the United States training station at Newport, R. I. One of the birds, according to the report of Commander T. J. Higginson, U. S. N., flew from the Hen and Chickens lightship to the cote at Newport, a distance of twelve miles, in 16 minutes and 35 seconds. Another bird flew from Washington to Fall River, a distance of 365 miles, in 11 hours and 7 minutes. A number of the birds were taken to New York on the Juniata last year, with the intention of liberating them along the coast, but the weather was unfavorable, and they were not flown. While at Brooklyn one of the pigeons escaped from the Juniata, and it was considered lost, as it had never flown a greater distance than from Point Judith, but in a few days the bird arrived at its home safely and in good condition.

War vessels employed in defending a coast are often without the means of transmitting information of the utmost importance to the mainland. By means of carrier pigeons they could send communications ashore over a distance of several hundred miles, signal the approach of the enemy's fleet, and report all his movements.

It would hardly be supposed that homing pigeons would have been called into requisition to aid operations in Wall Street, though such is the case. A well known stock broker purchased a farm in Somerset County, New Jersey; and finding that the telegraph service in the vicinity did not give satisfaction, especially when an excited stock market necessitated quick communication with New York, the broker decided to establish a messenger pigeon service of his own. The distance from his office in New York to his farm is forty-three miles. A hamper with several birds in it is kept in his office, and when the broker is spending a day or two at his farm, and his manager wishes to communicate the condition of the market, it is very quickly done by means of one of the birds. This gentleman went to an isolated point in Buzzard's Bay, Mass., on a fishing excursion, the only communication with the mainland being by a small steamer which arrived about twelve, noon, and departed at one o'clock. One day after the steamer had left the broker opened his mail and found that the stock market had taken an unexpected turn which necessitated immediate communication with his office. There was no telegraph or other means of communicating with the mainland, but fortunately he had brought with him the hamper containing the pigeons. A message was quickly written and attached to a tail feather of one of the birds, while to insure absolute safety a duplicate was attached to another bird. They were released at 3 o'clock in the afternoon, and arrived at the broker's farm early the next morning, so that the order which they transmitted was acted upon at the opening of the Stock Exchange, and resulted in saving a very considerable sum of money for the owner of the pigeons.

A MOUNTAIN RAILWAY NEAR NEW YORK CITY.

Thirty-nine miles above New York, on the west shore of the Hudson, the Dunderberg Mountain rises eleven hundred feet into the clouds, towering above all the other elevations in its neighborhood, and affording from its summit views of such grandeur and magnificence as are hardly to be surpassed anywhere in the world. On the extreme top of this mountain is to be built a great hotel, to be surrounded by a beautifully laid out park, and access thereto is to be provided for by means of a cable railway, whereby the cars will be drawn up in eleven minutes. The enterprise was conceived by Messrs. T. L. and J. H. Mumford, the controllers of the Mauch Chunk switchback railroad, and is being carried out by the Hudson River Improvement Company, of which Mr. James Morgan is president, at an estimated cost of $800,000. The trip to the top of the mountain, however, and the view to be obtained therefrom, will be by no means the principal attraction, for the return journey is to be made by a gravity spiral road, winding in, out, and around the various inequalities of the mountain and adjacent country for a distance of twelve miles, affording a noble panorama of constantly changing views to surprise the passenger at every turn.

Much of the work on this enterprise has already been done, the roadbed being now about ready for the rails, and the machinery and cars in a forward state of construction, so that it is expected the road will be opened to the public early next season. At the main station at the base of the mountain, convenient of access to passengers both by rail and boat, besides the car and engine houses, etc., there will be a large hotel and seven acres of ground to be used as a park for the accommodation of passengers waiting for trains or steamers. From this station runs a double plane about twenty-five hundred feet long, having at its top hauling engines and an electric light and pumping plant. A second double plane runs from this station to the summit. The hoisting machinery and engines, being built especially for this work, will embody all the best features hitherto known in such construction, as well as original plans for the safety of the drawing cables and safety ropes. The lower plane will have a maximum grade of 31 per cent, and the upper one a maximum grade of 28½ per cent. The back or gravity track will have an average grade of 1½ per cent, with a minimum of 1 per cent, and a maximum, on 40 degree curves, of 3 per cent. About one-quarter of the distance down, a dam across a deep gorge forms a beautiful lake or reservoir for the use of the hotels, cottages, and works of the company, and at three different points on the down track will be stations surrounded by grounds laid out for picnic purposes. It is intended to keep the road and grounds open from May until late in October. It seems difficult to make a really conservative estimate of the immense patronage which this most picturesque resort for summer excursionists is likely to attract, it being so easy of access by the great population of New York City and vicinity.

Collapse of a Standpipe at Temple, Texas.

The *Sun* of Temple, Texas, gives a thrilling account of the sudden collapse of the new standpipe pertaining to the water works in that town, which took place at 2½ A. M., in October last, when the inhabitants were wrapped in peaceful slumber. No danger was feared, when all at once, with a shock that shook the town, the 280,000 gallons of water went seething, foaming, and hissing over the doomed portion of the city, and immense sheets of boiler steel, hundreds of pieces of scaffolding, houses, barns, fences, and all the debris of the surrounding neighborhood went floating and crashing in all directions.

Everybody was awakened. The people in the houses near were almost frightened to death. The houses swayed with the rush of waters, and two of the nearest were taken away, one crushed and the other twisted and washed off its blocks.

There were sixteen sections of the pipe, a great hollow cylinder, 20 feet in diameter and of the heaviest boiler steel. Eight sections, or 40 feet, the lower tiers of the pipe, were thrown in a different direction, seven going east and one twisted and torn sheet going north and all lodging from twenty to fifty feet away. They were torn as the power of man might tear tin foil, twisted and crumpled as a seamstress would handle her cloth.

The standpipe was 120 feet high and 20 feet in diameter. It was built recently at a cost of $10,000, by Thomas & Gorman, of Houston, experienced contractors in this kind of structures. The material was the best sheet steel supplied by Ripley & Bronson, St. Louis, Mo.

The failure of this standpipe brings to mind the collapse of a similar pipe, which occurred at Sheepshead Bay, near New York, on October 7, 1886, and which was illustrated in the SCIENTIFIC AMERICAN of December 25, 1886.

Nickel-in-the-Slot Gas Meter.

A new penny-in-the-slot contrivance has been adopted by the gas department of the corporation of Birmingham, for the benefit of small consumers, and, incidentally, its own. The price of gas in Birmingham, as everywhere else in England, is, according to our ideas, low, the regular rate being sixty cents per thousand feet. Small householders, however, often like to enjoy a definite amount of such luxuries, without being bound to any regular contract; while the gas company is glad to make sure of its pay from such consumers, by getting it in advance. To meet the wants of both parties, a sort of meter has been constructed, which, on dropping a penny in a slot, will deliver twenty-five cubic feet of gas. This is at the rate of eighty cents a thousand feet instead of sixty; but the company feels justified in charging a rather higher rate to such small customers. If any of the latter wish for a larger supply, they may drop nine penny pieces at once into the slot, and 225 feet will then be delivered before the valve closes. The accumulated pennies are collected once a week by an official of the gas company. The burners on the house fixtures are regulated to burn five feet per hour, but, of course, they can be turned down, so as to burn more slowly. No direct charge is made for the measuring apparatus, the extra price of the gas delivered through it covering the expense.

Electricity in Paper.

How to control the electricity in stock, or which develops about a press in working, is a problem that still bothers many pressmen. We have given remedies for this trouble several times, and, as far as we have learned, all of them proved efficient.

For those who are only recent readers of the *Art Printer*, and indeed for older ones as well, let us say that the most thoroughly effective method is the use of a copper wire connected at one end with the zinc-covered fly board, and by a second wire with the feed board, and at the other end with the gas pipe at the ceiling or elsewhere, thus establishing electrical communication with the earth, to which the lower end of the gas pipe conducts.

Here is the *modus operandi:* As we have said, the fly board is covered with zinc. Under one side of this zinc, near the press, is thrust a piece of brass about two inches long, half to three-quarters of an inch wide, and an eighth of an inch thick. A thick piece of brass rule would do nicely. In the outer end of this brass rule a hole is made through which one end of the copper wire is passed and fastened. This wire is carried to the framework of the press, wound about the corner post of the framework, then carried along the entire foundation, winding about a pillar to keep it up. Reaching the corner post of the frame at the farther end, the wire winds about it and is then passed up and fastened to the gas piping at the ceiling.

A second wire connects with the first one at the center of the foundation frame, and runs winding round the central post directly under the lower end of the feed board, near the gripper line. Having reached the feed board it is passed through the hole of another piece of brass similar to the one at fly board. This second piece of brass is attached to the iron framework of the gripper or guide motion.

The point is to establish a conducting line between the paper and press, wherein electricity is either stored or generated, and the earth, along which line the fluid has a chance to escape or be drawn. This done, there is no more worry about electricity around a press.

Some pressmen cover the feed board with zinc—or the lower part of it—as well as the fly board, in order to insure the action of the two metals, zinc and copper, upon the electricity in the paper; but the experience of the majority who use the wires is that if the connection is properly made with the metal of the gripper motion, contact is certain, and the electricity is absolutely drawn off and sent through the gas piping.

The wires being wound about the press, as well as being brought into contact with the paper, catch all the electricity generated by the rapid motion of the machine and send it off in the same way.—*Amer. Art Printer.*

Edison Toy Manufacturing Company.

The annual meeting of the Edison Toy Manufacturing Company was held at Clarence Hale's office in Portland, Me., October 30. Mr. Edison was represented by his secretary, Mr. Tate. This was the treasurer's exhibit September 30:

LIABILITIES.	
Capital stock	$1,000,000.00
Working capital	62,871.37
Total	$1,062,871.37
ASSETS.	
Treasury stock	$160,000.00
Licenses and patents	846,894.84
Cash	2,973.03
Cost of dolls' parts and merchandise	35,384.23
Edgar S. Allen, general manager	69,025.00
European expense account	5,699.84
Thomas A. Edison	1.000.00
Office furniture	1,229.18
Total	$1,062,871.37

These officers were elected: Directors, Benjamin F. Stevens, Danield Weld, John W. Mackintosh, Winfield S. Hutchinson, Thomas A. Edison, George Borgfeldt, Oscar E. Madden; clerk, Clarence Hale; treasurer and secretary, Daniel Weld.—*Electric Review.*

A RATHER handsome compliment has recently been paid to the SCIENTIFIC AMERICAN by the well known jewelers Messrs. Benedict Bros., of 171 Broadway, N. Y., who have designed a novel and beautiful match box representing a copy of a newspaper folded in a wrapper. The ends of the paper extend beyond the wrapper and display the familiar heading of the SCIENTIFIC AMERICAN. The wrapper has a blue enameled penny postage stamp and bears the New York postmark, while a blank space is left for the name and address of the owner to be enameled in black on its surface. It was found desirable to select some representative non-political journal, and the SCIENTIFIC AMERICAN was chosen as most appropriately filling the requirement.

We take pleasure in acknowledging the compliment that has been offered us.

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The Patent Sales Agency Business.

Those of our readers who have taken out patents within recent years know something of the extent to which inventors are besieged by various individuals and firms from Maine to the Pacific coast, who are anxious to negotiate the sale of patents, and whose circulars, letters, pamphlets, etc., are many of them skillfully designed to make the unhappy inventor, whose name and address has just appeared in the *Patent Office Gazette*, believe that there are plenty of people who are anxiously waiting for an opportunity to buy his patent and pay fabulous amounts for it, only these persons must be found.

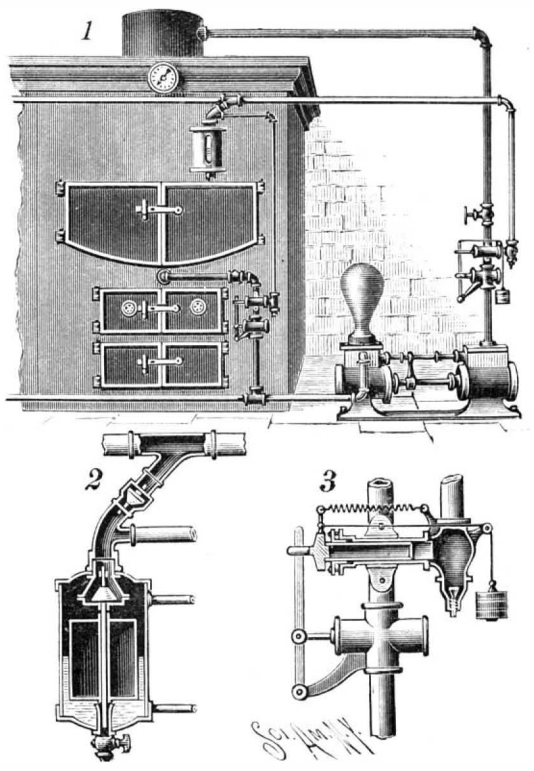
The finding of them is what these patent salesmen propose to do. Their proposition is usually to take the patent in hand and find a purchaser for it, charging a percentage for their services. But the main feature of the business seems to be the fact that the inventor is always required to pay a certain amount of cash, varying with different concerns from five to twenty dollars, as his part of the expense of advertising, traveling, correspondence, etc. It is perfectly safe to say that in a vast majority of cases this payment required of the inventor upon placing his patent in the agent's hands pays not only a part, but all the expenses involved, and leaves a handsome profit to the agent; in most cases probably all the profit he seriously looks for from the transaction.

Sometimes, after a year or so has passed by, the anxious inventor, who has invested some of his cash in "advertising expenses," is informed that the arduous labors of the agent have at last resulted in the finding of a man who wants the right to make and sell the invention in several States, but can only pay for it in land upon which there is some sort of incumbrance to the amount of say fifty to a hundred dollars, varying in different cases. If the inventor will forward the amount to the agent, the sale will be immediately closed.

The significant feature of the whole business is, says the *American Machinist*, and which, from the long experience of the editors of this paper with this class of people, they can verify the truthfulness of, *i. e.*, that the inventor is in every case required to pay something for which he has no assurance of a satisfactory return, and it is easy to see that with the vast number of patents being taken out, many of them by people more or less unused to the ways of the world, the income of these selling (?) agents must be considerable if they succeed in getting payments of small amounts from only a small fraction of the total number of patentees.

AN AUTOMATIC STEAM BOILER FEEDER.

In the accompanying illustration of a boiler feeder, patented by Mr. Bernard Devlin, of No. 327 Grand St., Jersey City, N. J., Fig. 1 shows a front view of one of two or more steam boilers and feed pumps therefor, with the improvement applied. Fig. 2 is an enlarged sectional view of the valved regulating drum or casing and connected steam pipes, and Fig. 3 is an enlarged



DEVLIN'S AUTOMATIC STEAM BOILER FEEDER.

view of the steam-actuated regulator device shown in connection with the pump. The drum is connected to the steam and water spaces of the boiler by upper and lower pipes, and is fitted with an ordinary gauge glass. Within the drum is a float having a vertical spindle guided in a tubular bearing at the bottom, and in an upper cross bar or bridge piece and a skeleton bearing, both fixed to a hollow fitting flared downward from the top of the drum, and forming a seat for a conical valve fixed to the float spindle. Suitable collars or washers on the spindle hold the float in proper relation to the valve and its seat, causing the float when lifted by rising water in the drum to close the valve and cut off flow of steam from the upper part of the drum to a pipe leading therefrom. Side holes in the spindle guide near the bottom of the drum give outlet to a blow-off cock for cleaning the drum when desired.

To the pipe leading from the top of the drum is coupled another containing a check valve, a pipe from which is connected to a steam pipe leading to a regulator which controls the steam inlet in a steam supply pipe which leads from one of the boilers to the valve chest of the feed pump. To a nipple on the pipe leading from the top of the drum, between its valve and the check valve, is coupled another pipe which leads to a similar regulator bolted or clamped to the feed pipe, and provided with a gate valve. Such a pipe connection and regulator are provided between the drum and each of any number of boilers set up in a battery. These regulators, as well as one to control an injector, are made alike, the regulator in the latter case receiving steam from the drum while a steam pipe connects the steam space of the boiler with the injector, to which is coupled also the feed water supply pipe, which may have a valve controlled by the regulator. A valve may also be fitted into the steam supply pipe from the boiler, near the regulator, to be controlled by the latter simultaneously with its control of the main water inlet valve.

The regulator itself has a hollow rear chamber, from the side of which projects a cylinder, into which is fitted a piston made as a cylinder, closed at its outer end by a head, and surrounded by a packing. One end of the hollow rear chamber is connected to the steam pipe leading from the drum, and to its other end is fitted a check or relief valve, closing by pressure from the pipe, but normally held open by a spring on its stem. A stop device limits the outward movement of the cylindrical piston, and a retracting device is provided, which may be a weight from a cord running over a pulley on the hollow rear chamber and connected to the head of the piston, or a spring connecting the piston head and chamber. By means of certain rod and link connections to the head of the regulator piston, one regulator may operate the main steam and water inlet valves and the steam and water valves of an injector, when the latter is used instead of a pump to feed a boiler.

The operation of this boiler feeder is entirely automatic, and very simple and effective. When applied in connection with two or more boilers, each boiler is fed independently of every other boiler, the check valve of the boiler in which the water stands at the proper level being closed by steam pressure in the pipe leading to the regulator, so as not to prevent the free operation of the drum valve at the boiler, and when all the boilers are filled to the proper water level, the feeding pump will stop, as its valve will remain closed. A similar effect is also produced, through the regulator, in starting and stopping the injector, when the latter is used to force the feed water into the boiler.

A REFRIGERATOR VEHICLE FOR PERISHABLE ARTICLES.

A vehicle provided with refrigerating compartments especially adapted for the storage and conveyance of milk or other perishable articles is represented in the accompanying illustration, and forms the subject of a patent recently issued to Mr. Charles A. Knight, of No. 98 Sterling Place, Brooklyn, N. Y. In the roof of the rear section is a horizontal partition which forms a top chamber, and bars extend from the partition to the floor of the wagon at the sides. Sheets of zinc or other suitable metal or non-conducting material are secured to the inner faces of these bars and the side uprights, these sheets constituting the sides of the refrigerator and, with the uprights, forming side flues through which air passes from bottom apertures into the top chamber, while the latter has front and rear openings, the air passing through which is designed to create a suction and cause currents of air in the direction indicated by the arrows. A second horizontal partition in the top of the refrigerator proper forms a storage compartment, open at its front end and with an upwardly opening hinged door at the rear. In the front end of the refrigerator is a fixed central perpendicular post, to which are hinged two doors closing against the sides of the vehicle, and centrally in the rear is a removable post constituting the rear wall of an ice chamber, at each side of which are arranged compartments for the reception of baskets or boxes containing the milk cans or other articles to be placed in the refrigerator. These compartments have openings on their inner sides, toward the ice-containing chambers, and they are built up in such manner as to have tracks or slideways in their bottom edges, to facilitate the placing and removal of the baskets or boxes, etc.

KNIGHT'S REFRIGERATOR MILK WAGON.

The bottoms of the ice receptacles have apertures, the drip from the upper one passing into the lower one, and the latter draining through a tube in the bottom of the refrigerator, passing through the wagon bottom.

The Gypsy Moth.

Mr. J. O. Goodwin writes as follows to the Medford *Mercury:*

"I have had quite a little experience with the pest, as in the rear of my premises are three or four large apple trees which have been wholly uncared for by the owner, and the tent caterpillar and gypsy worm have held high carnival there until every vestige of green has disappeared. After devastating my neighbor's trees they *marched in myriads* for my premises, fairly covering the fences, houses, outbuildings, grass-land, current bushes, and concrete driveways with their trooping battalions. I immediately tacked tarred sheathing paper around every one of my trees and keep the paper well coated with printer's ink. The worms will not go over the printer's ink if care is taken to make frequent application of it. Experience, the best of teachers, proves it. During the past week or ten days I have personally attended to the matter and have killed millions of gypsy worms which have congregated below the paper on my trees. The trees nearest my neighbor's land were the first ones attacked (they will not pass a tree), and five or six times a day the trees below the paper are literally covered with thousands of worms, notwithstanding I take great care to kill every worm seen at each inspection, while not a worm can be found on the tree above the application of printer's ink. The number of worms culitivated on the three or four worthless trees on the premises adjacent to my own is astonishing; numbers fail to convey an adequate idea. The grass-land and the earth seemed to be covered with them. In fifteen minutes after killing every worm to be seen on the trunk of the tree below the tarred paper, hundreds can be found making their way up the trunk, to be stopped by the application of printer's ink."

The "Serve" Boiler Tube.

The "Serve" tube differs from the ordinary boiler tube in having eight internal ribs one-half inch in height, in 3 inch tubes, which have the effect of increasing the efficiency of the tubes as heating surface, by absorbing the surplus heat in the gases, as they pass from the combustion chamber to the funnel. Indeed, the extent of tube surface coming into contact with the gases is nearly double that of a plain tube. The inventor, M. Jean Serve, is a native of France, and in that country the invention has already found considerable favor, as it effects an economy of 10 per cent in fuel.

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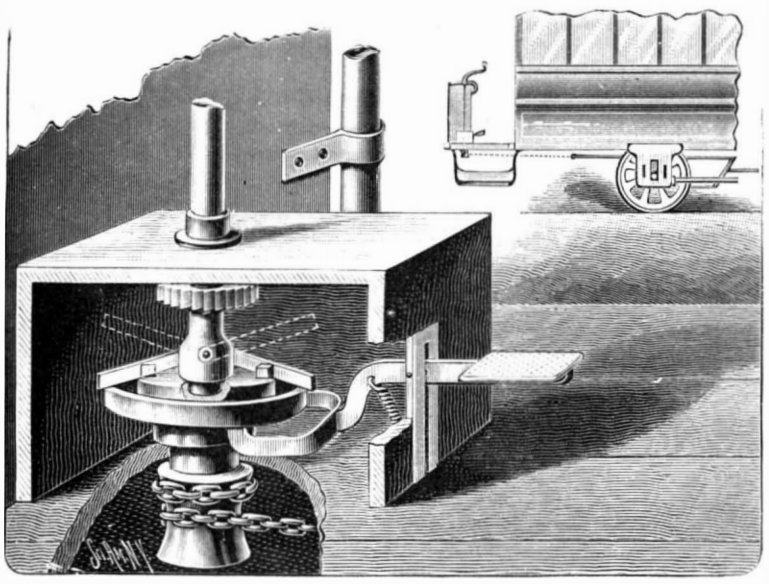
A BRAKE FOR STREET CARS.

The device shown in the engraving is designed to be operated as easily and effectively as the ordinary brake, while it obviates the forcible flying back of the brake-shaft crank-arm as the brakes are taken off, whereby persons standing on the car platform are frequently injured. The drum on which is wound the chain connected with the brake beams is journaled in the car platform, the top of the drum shaft carrying a



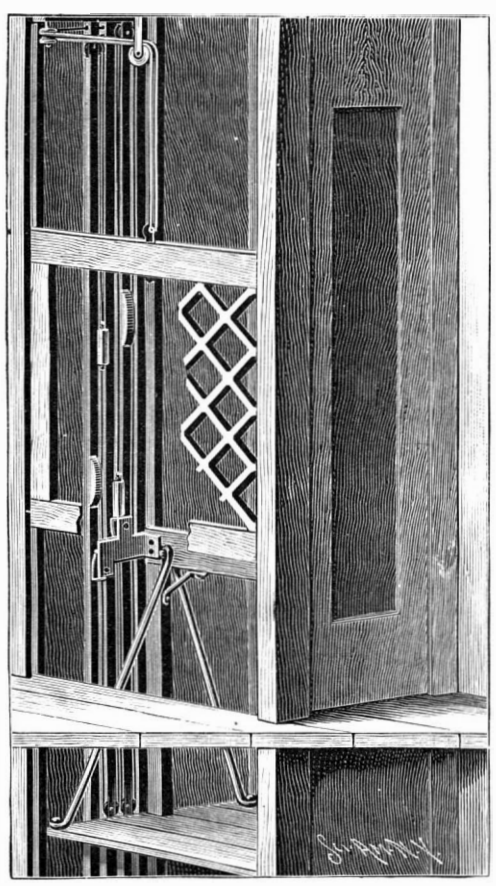
CHASE'S STREET-CAR BRAKE.

head-plate, which preferably furnishes a loose bearing for the lower end of the usual vertical brake-shaft, journaled to the dash-board and in the top of a box or casing on the platform. The chain drum is not fixedly connected to the brake-shaft, but the latter carries at its lower end two pivoted clutch-bars adapted to engage two lugs on the head-plate of the drum shaft. These clutch-bars automatically drop by gravity into engagement with the lugs, but to disengage them, as shown in dotted lines, and allow the drum shaft to unwind without rotating the brake-shaft and its crank, a trip device is provided, consisting of a ring which underlies the outer ends of the clutch-bars, and is connected to a treadle lever. A spring normally holds the ring down, except when the treadle is depressed. Within the box or casing is arranged a spring-pressed pawl which engages a ratchet wheel fixed to the brake-shaft to prevent backward turning of the clutched shaft and chain drum when the brake is applied.

For further information relative to this invention address the patentee, Mr. Joseph C. Chase, No. 88 Lyons Street, New Orleans, La.

AN IMPROVED ELEVATOR GATE.

The construction shown in the accompanying illustration is designed to provide for the dropping of an elevator gate by gravity, while the descent of the gate



GOLDER'S DEVICE TO OPERATE ELEVATOR GATES.

will be so controlled that nothing will be broken if the gate meets an obstruction. It forms the subject of a patent issued to Mr. William H. Golder, Nos. 18 and 20 Front Street, Portland, Oregon. In a vertically extending strip on one side of the elevator well are arranged three parallel vertical dovetailed slots, and pivoted in the upper portion of the strip between the slots are three pulleys, one a little above the other. Aligning with two of these pulleys are two pulleys pivoted in the lower portion of the strip, the pulleys at the top and bottom being adapted for the passage of the gate cables. In each of the two outer slots of the strip is dovetailed a catch projecting from the face of the strip and adapted to move vertically therein to engage the gate-operating latches, the catches being connected with the gate-operating cable. The latter is attached centrally to the upper portion of the gate, and is composed of two strands or members which pass upwardly over pulleys pivoted near the upper part of the story, thence turning at right angles and passing over pulleys pivoted near the upper corner of the elevator well, from which one of the members passes over the pulley pivoted at the top of the first dovetailed slot, and the other member passes over the pulley pivoted at the top of the third dovetailed slot. The member passing over the first pulley is continued down the slot and attached to the catch, while the other member extends down the third slot, over a pulley at the bottom, and up to the other catch to which it is attached. A second cord or cable is attached to the upper end of the first catch, and extends upward over the central pulley and down to engagement with the second catch, while a third cable extends downward from the bottom of this catch, around a pulley, and up to engagement with the bottom of the first catch, making a continuous cable system from the elevator gate around the pulleys. Projections having inclined ends are fixed to the vertical strips between each floor of a building, and a plate is fixed to the top of the elevator car to project across the strip, the plate having pivoted latches and oppositely projecting spring catches overlapping the grooves to engage the catches and projections, the operation being such that when the gate drops one of the latches is supported on a catch, thus allowing the gate to drop with the same speed as that at which the elevator car moves, and preventing it from falling too fast.

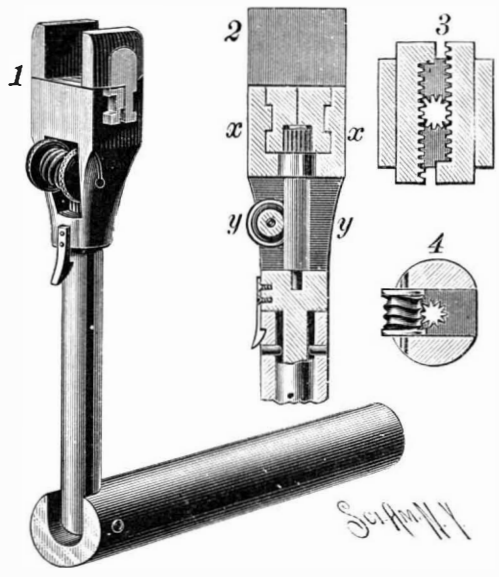
A CORK-DRAWING DEVICE.

The device shown in the cut is designed to facilitate the drawing of corks from the inside of a bottle without breaking the cork. It has been patented by Mr. Bernard Tormey. The body of the implement consists of a flat strip of spring metal, the upper end of which is looped over a handle, while, at a slight distance ftom its lower end, are outwardly and upwardly extending claws, another set of similar claws being arranged at a point higher up on the strip. In operation the body of the device is inserted in the vessel, when the cork is engaged by the claws and drawn out through the neck, as shown in the illustration. The handle has one tapering outer end, suitable for use in forcing the cork down into the bottle in case of full bottles or where the cork has lodged in the neck, after which the cork is withdrawn as described.

Further particulars relative to this invention may be obtained of Mr. M. E. Donally, No. 166 Third Avenue, New York City.

A MARKER FOR WOOD-WORKERS.

The illustration shows a machine especially designed for laying off and marking the stiles of shutters and doors and similar work, preparatory to cutting the mortises by a mortising machine, to save labor and insure accuracy in the joiner work. It has been patented by Mr. Robert G. Love, of No. 814 East Clay St., Richmond, Va. Upon the front edge of a strong framework, adapted to support dressed lumber, is fixed a stationary horizontal rail having horizontal slots in which slide markers. These markers, one of which is shown in the small figure, have toothed edges, and are fastened by a screw to a dovetail lug in a block clamped to the rail by a screw bolt passing through one of the slots, whereby the markers, of which there are a number in the rail, may be adjusted horizontally as desired. To limit the depth of cut of the marker teeth, an adjustable stop-screw is placed in each block beside the marker blade. A second movable rail similarly slotted, and provided with markers which point inward, is arranged in front of and parallel to the stationary rail, the movable rail being fastened by means of screws and tail guides to a reciprocating frame which slides upon horizontal guide rods supported at their outer ends by offsetting curved brackets. To the bottom of the frame are jointed the outer ends of curved connecting bars which at their inner ends are jointed to cranks on a rock-shaft, the latter being connected by other cranks with a vertical

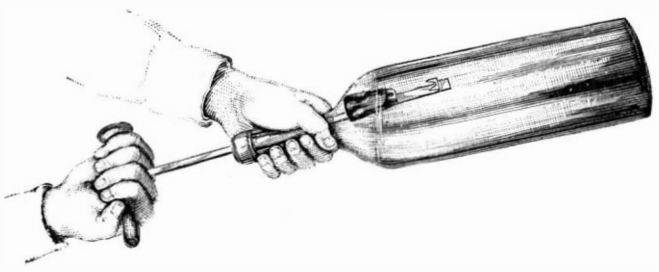


O'NEILL & REINHART'S WRENCH.

pitman jointed to a treadle. When the treadle is depressed, the reciprocating frame, carrying the front rail with its markers, is forced inward, marking upon both sides at once the piece of lumber that has been placed beneath the rails. A vertical leaf spring is arranged to force the reciprocating frame backward when the foot is removed from the treadle.

AN IMPROVED WRENCH.

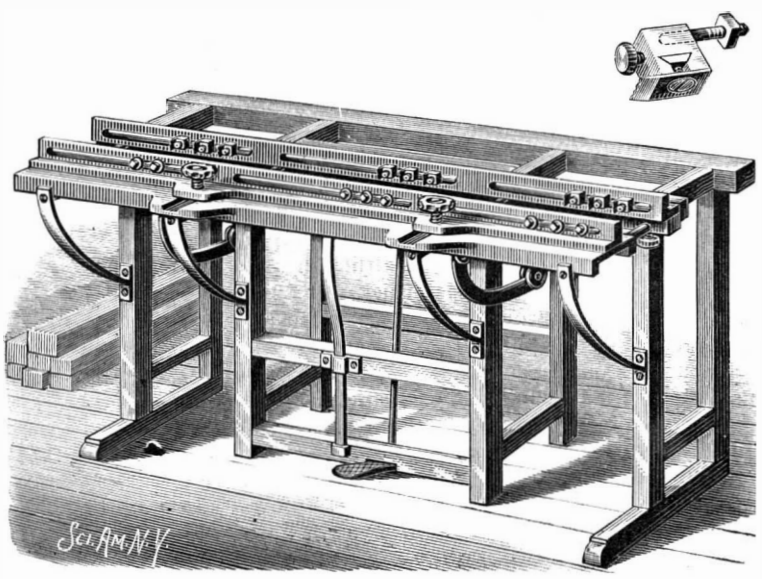
The wrench shown in the illustration, of which Fig. 1 is a view in perspective and Fig. 2 a longitudinal section, is especially adapted for use in places where working room is limited and where ordinary wrenches cannot be employed. The jaws of the wrench extend outwardly from arms adapted to slide longitudinally in suitable guideways in the head. On the opposite faces of the arms are formed racks meshing into a gear wheel, as shown in Fig. 3, which is a sectional plan view on the line, $x\,x$, of Fig. 2. This gear wheel is on a central shaft turning in suitable bearings, and on



TORMEY'S CORK-DRAWING DEVICE.

the portion of this shaft shown at $y\,y$ in Fig. 2 are vertically arranged worm teeth, adapted to be engaged by a longitudinal worm wheel, as shown in the sectional view, Fig. 4. The worm wheel has milled heads, by turning which the central shaft is rotated, with the gear wheel meshing in the racks, whereby the jaws are made to approach or recede from each other.

The handle is preferably made in two parts, one part rigidly secured to the head and having side grooves engaged by pins near one end of a cylindrical part adapted to be closed over the other part and held



LOVE'S MACHINE FOR LAYING OFF WOOD-WORK.

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thereon by a spring latch. This cylindrical part may be disengaged from the latch, moved outward, and swung into a right angular position as shown in Fig. 1, to be used as a lever to turn the wrench.

For further information relative to this invention address the patentees, Messrs. Augustus J. O'Neill and Henry Reinhart, in care of Parrot Smelter, Butte City, Montana.

THE DEFENSE OF NEW YORK.

It has for many years been patent to every one that New York City, with the great industrial forces and vast aggregate of wealth concentrated around what is known as the Port of New York, are entirely without defense against such an attack as might be made by the vessels of any first class power with but a few hours' notice. The forts at present guarding the entrance to the harbor would not protect the city from the long-range guns now in use, and in heavy armored vessels, and the high-powered ordnance therefor, by which such attack might be repelled, we have as yet nothing that will compare with the great ironclads of several of the European powers. The matter has for several years had much consideration by eminent engineers of the government War Department, but no complete system, adequate as a permanent and thoroughly effective defense, has yet been decided upon, although the Fortifications Board has declared the urgent need of such work, not only at New York, but at twenty-seven of our seaports, New York coming first on the list, Boston second, and San Francisco third.

The illustrations on our first page present a plan quite unlike anything heretofore attempted anywhere for the construction of forts for the defense of the ocean approach to the city. It has been, in fact, only within a few years that such constructions would have been deemed at all possible, but such have been the recent advances in engineering methods and practice that not only does the plan appear practicable, but engineers are ready to-day to figure on the cost and at once commence the work. The plan we illustrate has been brought forward in its present shape by Mr. John F. Anderson, a New York engineer, and consists in the construction, on artificial islands, of three forts, each with a diameter of 500 feet, between Rockaway Beach, on the Long Island shore, and Sandy Hook point. The bird's eye view afforded by the principal engraving gives a good idea of their proposed location. They would be about two miles apart, and the same distance from each shore, so as to command all the channels of approach, while being from twelve to fifteen miles distant from the city.

At the points where it is proposed to place these forts there is now a depth of water of from twelve to twenty feet, but with deep water on all sides in each case. The manner of their construction is not unlike that of several large engineering undertakings which have been successfully prosecuted by Mr. Anderson. There will first be built, of iron or steel, a double-walled circular caisson having an outside diameter of 500 feet and an inside diameter of 400 feet. The inner and outer shells of the walls of the caisson will be suitably tied together by cross rods and braces, and the bottom of this space will be shaped to form an inner and outer cutting edge, with an intermediate working chamber, as shown in the sectional view at the middle of the page, while vertical working pipes or wells will be placed at frequent intervals. This structure will be towed to the proper position over the shoal where the future island fort is to be made, where it will be sunk by opening valves in the bottom. The space between the outer and inner walls is then to be weighted with concrete, and at the same time the sand underneath the structure is excavated through the wells in the ordinary manner, so that as the excavation proceeds, the caisson will continue to sink evenly, and a solid wall of concrete will be built up within the iron shells.

The excavated material passed up through the working wells would be dumped on the inside, to fill the area inclosed by the walls. The remainder of the interior filling would be readily accomplished by means of steam sand pumps or dredges, which would take up sand from the sea bottom outside the fort, and dump it within the inclosure. Thus the principal materials required for the work are ready at hand.

The plates forming the shell for the walls would not necessarily be carried up further than was required by the sinking of the caisson, but, although the walls of this fort would be fifty feet thick, it is probable that their outer face would be provided with a belt of nickel steel or other approved armor. The guns with which such fortifications would be provided would, of course, be of the heaviest and most effective kind, and they would probably be mounted in armored turrets, whereby the guns and gunners would be protected during loading and training. An oscillating turret for heavy guns, operated by hydraulic rams, is now in use in France, with which a crew of five men and one officer are found sufficient to fire a 100 ton gun twice in three minutes. There are also various methods of mounting heavy guns on disappearing carriages and lifts, whereby the gun will be exposed to an enemy's fire only at the moment of firing, and a fort of the character described would afford facilities for mounting and working such an armament far superior to those which could be provided on the largest war vessels.

Another feature proposed by Mr. Anderson in the plan for these forts is to have a portion of their interior left partially open on the New York side as a harbor for torpedo boats or rams.

In the view at the top of the page one of the proposed forts is shown, presenting a space of about five acres, with temporary buildings occupying a portion of its area, in the manner it would probably be used in time of peace, a bomb-proof magazine being centrally located almost entirely underground. The top of this magazine would be protected with any required number of heavy plates, and underground passages would probably lead from it to each gun or battery.

Mr. Anderson has roughly figured up the cost of building an island such as here described, and estimates that three of them could be built at an expense of about one million dollars each. His approval of the scheme as entirely practicable, and the moderate figure at which the outlay for such defensive works is placed has caused considerable attention to be attracted to the plan. Mr. Anderson now has a contract with the government for building a lighthouse off Cape Hatteras, he has built the foundations of many of the most important bridges in the country, and in the building of the Hawkesbury Bridge, at New South Wales, Australia, he successfully carried down piers 155 feet below the water line and 108 feet below the bottom. It is not expected that the caissons for the proposed island forts would have to be carried to a great depth to obtain a firm foundation.

Taking Care of Ropes.

An article in a recent issue of the Chicago *Journal of Commerce* gives some interesting and valuable information regarding ropes, from which the following extracts are made. It is stated that the reason why it is necessary to take out the "turns" in a new rope, and that it is untwisted when first put to work, is that in making ropes, the fibers are first spun into yarn, this yarn being twisted in a direction called right hand. From twenty to one hundred of these yarns are then put together and twisted in an opposite direction, or left handed.

This forms a single strand or rope; from three to four of these strands are again twisted together, and it will be noticed that as this twisting is again in the right hand direction, it untwists the strands and again twists up the yarn. When a weight is placed upon one end of the rope, its tendency is to untwist and become longer, and the untwisting will continue until the strain of the untwisted strand just equals the strain of the yarn being twisted together.

If it were possible, in making a rope, to put in just enough twist so that these strains should balance each other, then there would be no necessity for taking out the turns when a new rope is put to work. The greater the twist, the harder the rope, and to the contrary, a rope with little twist is much softer and stronger. The reason for this is easily seen, as in a tightly twisted rope the strain does not come as near in the direction of the length of the rope; that is, the fibers lie at a greater angle to the axis of the rope, and weight upon the rope forms a breaking instead of a stretching strain.

Ropes sometimes wear out internally while apparently sound outside. This is caused by bending the rope over a sheave. In doing this the fibers slide a small distance upon each other and eventually wear out. In the best ropes this wearing out is prevented by lubricating the strand with plumbago, mixed with a small quantity of tallow, just sufficient to hold it in place.

In designing pulleys, they should not be made less than forty diameters of the rope; this is the limit of economical wear and they may be made as much larger as practicable. The speed of ropes may vary from 2,500 to 5,000 ft. per minute. If five feet be taken as a minimum diameter of a pulley for a rope one and a half inches in diameter and running 2,500 ft. per minute, the pulley should increase one foot in diameter for each 1,000 added revolutions per minute.

Imitation of Marbles.

Good Portland cement and colors that take on that material are mixed dry and made into a paste with the least quantity of water added. One paste has to be made for each color. The different pastes are placed on top of one another in layers of different thickness. The mass is pressed from all sides and beaten so that the colors of the different parts impress themselves on each other without uniformity. The result is that more or less deep veins penetrate the mass; this is then sawed into plates, which are pressed in a mould for twelve days, during which time it is necessary to keep them moist as long as they are not entirely hardened. The plates are polished in the same way as marble.

Census Adventures in Alaska.

A recent report of progress in taking the census of Alaska has been issued by the U. S. Census Office in the form of a bulletin. It comprises a preliminary report by Mr. Ivan Petroff, special agent in charge of the Alaska division, and embodies a vivid picture of the difficulties encountered in getting results in the northernmost regions of the United States. After a preliminary trip in the mail steamer, a second trip was undertaken from San Francisco to the shores of the Bering Sea, at Nushegak, in a leaky little steamer of only 25 tons burden. Special agents for different sections were appointed and sworn in on these voyages. To reach one special agent a voyage up the Nushegak River was undertaken, but failed, owing to his recalcitrant Indian paddlers. On returning to Nushegak, the U. S. Fish Commissioner's steamer Albatross took the party on board, and after six days landed them on an inhospitable shore, with a crew of Indians, mostly sick from pneumonia. The work, in spite of all obstacles, was accomplished, Mr. Petroff having divided the territory into six districts and organized a force of special agents familiar with the many languages spoken there. His journeys aggregate some 12,000 miles, while the special agents will probably travel over five times as much ground to cover Alaska's 570,000 square miles of territory.

Effect of Copper upon Rubber.

In a paper read before the British Association, Sir William Thomson made interesting remarks relating to the decay of India rubber. The following extract, showing that copper has a marked effect upon rubber when in contact, will be noted with interest: Prof. Dewar observed, accidentally, that metallic copper, when heated to the temperature of boiling water, in contact with the rubber, exerted a destructive effect upon it. With a view of finding whether this was due to the copper *per se*, or to its power of conducting heat more rapidly to the rubber, he laid a sheet of rubber on a plate of glass, and on it placed four clean disks, one of copper, one of platinum, one of zinc, and one of silver. After a few days in an incubator at 150° F., the rubber under the copper had become quite hard, that under the platinum had become slightly affected and hardened at different parts, while the rubber under the silver and under the zinc was quite sound and elastic. This would infer that the pure metallic copper had exerted a great oxidizing effect on the rubber, the platinum had exerted a slight effect, while the zinc and silver respectively had had no injurious influence on it. A still more curious result was this, that the rubber thus hardened by the copper contained no appreciable trace of copper; the copper, therefore, presumably sets up the oxidizing action in the rubber without itself permeating it.

The Use of the Diamond Drill by the Ancient Egyptians.

Mr. W. F. Durfee recently, in connection with his lecture at the Franklin Institute, Philadelphia, investigated the curious question of the ancient use of an annular drill, equivalent in mechanical action to the modern diamond drill. Through the U. S. Secretary of State and the U. S. Consul-General at Cairo, the Hon. Eugene Schuyler, a statement from Mr. Flinders Petrie was secured. It is this last named archæologist who originated the theory. The substance of the statement is as follows: In Mr. Petrie's "Pyramids and Temples of Gizeh" illustrations are given of samples of work, showing in his judgment the use of jewel points in drilling and sawing. Various samples of this work he states are now in his own possession. In Egypt he cites six examples, some in the Bulak Museum and some at Gizeh. One is of special interest. In the granite temple at Gizeh there is found in one of the lintels of a door a drill hole with the core still sticking in it. Almost as interesting as this is a base of a tube drill hole between the feet of a statue of Chefren (Kofra) now preserved in the Bulak Museum.

A Life-Saving Invention for Use at Fires.

Mr. Alfred Harley, of Albany, N. Y., has invented a life-saving apparatus to catch those who are forced to jump from windows in case of fire. A cushion or mattress is carried upon a suitable carriage or running gear. Springs of long range of action are placed intermediately between the mattress and carriage frame. The whole is so light that it can be very speedily dispatched to the scene of conflagration. The springs are not the only feature of construction. Under the stress of a falling body the mattress may descend nearly three feet. This might result in a disastrous rebound. To prevent such action, dashpots or air cushions are applied, as in the well known door checks, so that the mattress gradually rises to its normal level. Deflecting wings are provided that increase the effective area of the apparatus to about 100 square feet. It is claimed that with the ordinary life-saving net the jumper must be an expert as well as the men who catch him as he descends. Mr. Harley's contrivance eliminates to a great extent the expert element, and would seem to be a most useful advance on the old form of net.

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Correspondence.

Extraordinary Depression in the Bed of a Florida River.

To the Editor of the Scientific American:

The following information regarding a phenomenon to be seen in Southern Florida would perhaps be of interest to you and the readers of your paper.

While knocking about the Gulf coast of Florida during the months of January and February, 1890, in search of game, our party had occasion to verify the long-rumored existence of an extraordinary depression in the bed of the Myakka River, situated immediately below what is known as Myakka Lake. This river is shallow and slowly flows over a bed of sand and ooze, and was at the time that we saw it extremely low, having, in fact, no longer a connection with salt water. Ten miles distant from the coast, and near the above mentioned lake, we came across a dark circular pool of water filled with innumerable fish and turtles (writer counted at one time 56 head of leatherbacks appearing at once). Our attention was attracted by the blackness of the water, which was plainly due to the great depth and to no impurities held in solution. We sounded the pool with a primitive arrangement of fish lines and wooden floats, and found it to be 136 ft. Considering the shallowness of all other bodies of fresh water in Florida, this is phenomenal; what makes it more so is the strong indication of a tide, *i. e.*, a regular ebb and flow in the water of this depression corresponding to that of the sea, ten miles off, although there is not a trace of salt to be found in solution. Lead sinkers that went to the bottom came up coated with a jet black deposit. The shaft that descends to such a depth must have sides of stone or coral, as the sand that lines its shores would soon fill it to the top from its tendency to drift, were it otherwise.

Have any of the readers of the SCIENTIFIC AMERICAN information of a similar freak in the formation of the soil of Florida?

As far as I know, our party may claim to have sounded and verified the greatest depth of fresh water in that State, exceeding, in fact, any depth to be found fifty miles off shore in Gulf of Mexico.

HENRY H. KOEHLER.

Louisville, Ky.

The Telephone Suggested in 1854.

To the Editor of the Electrician, London:

SIR: We are all familiar with the earlier telephonic experiments of Reis, which are given in the *Jahres Bericht des Physikalischen Vereins*, of Frankfort, for 1860–61, and which are regarded as the precursor of the telephone of Graham Bell. Prof. Bell read a paper on the subject before the Society of Telegraph Engineers on October 31, 1877; and at this lecture I called attention to a still earlier description of a telephone by Charles Bourseul, which is to be found in the second edition of the Comte Theodore du Moncel's *Exposé des Applications de l'Electricité*, published in Paris in 1857 (vol. iii., p. 110). Du Moncel does not give any reference to the original paper; but in the *Didaskalia*, a weekly paper published at Frankfort-on-Main, dated September 28, 1854, there is an interesting account of his invention, which I do not remember to have seen printed in England. I am indebted to Messrs. Siemens Brothers & Co. for making the translation which I inclose, and, if not hitherto published, it will, I am sure, interest your readers, as his description of the principle of the telephone is almost as clear as if it were written at the present date. If he had only put his ideas to the test of experiment, we should have had the telephone in 1854.

It would be interesting to find the original source from which Count du Moncel derived his account of Bourseul's telephone. Yours, etc.,

LATIMER CLARK.

6 Westminster Chambers, Victoria Street,
London, October 28, 1890.

Didaskalia, No. 322, Thursday, September 28, 1854.

ELECTRICAL TELEPHONY.

The number of miracles with which electricity has astonished us lately is said to have been increased by one which would not only cause a revolution in electrical telegraphy, but would add considerably to its utility. The invention in question is nothing less than the electrical transmission of the *spoken word*. The idea was conceived by an educated and modest young man named Charles Bourseul (now living in Paris), who was a private in the African army in 1848, where he brought himself under the notice of the Governor-General by a course of mathematical lectures which he gave to his comrades in the garrison of Algiers. Possibly Bourseul's scheme, of the practicability of which he is perfectly convinced, may be one of those which learned men will afterward declare very simple, and which, if troubled about, would have been brought out much sooner. The principle of electro-telegraphy, as is well known, is the following: An electric current passing through a metal wire surrounding a piece of soft iron transforms the latter into a magnet. The magnetic properties of the iron vanish when the electric current is discontinued. This magnet, called the electro-magnet, can, therefore, alternately attract or repel a movable plate, which by its forward and backward movements produces the conventional signals used in telegraphy. It is further known that all sounds are transmitted to the ear through the air vibrating; and that, therefore, sounds are virtually vibrations of the air, and that the infinite variety of sounds is solely dependent on the rapidity and strength of these vibrations. If it were possible to construct a metal plate sufficiently sensitive and flexible to admit of the reproduction of the vibration of sounds (like the air), and if this plate could be connected with an electric current in such a manner as to alternately interrupt and continue it according to the vibrations of the air to which it would be exposed, it would be equally possible to electrically affect a similar metal plate so as to repeat exactly and simultaneously the vibrations of the first plate. This would create the impression as if the speaker had spoken in immediate vicinity of the second plate, or, if put differently, the ear would be affected in a similar way as if it had received the sounds through the first metal plate. Electrical telegraphy, which was once academically declared to be almost an absurdity, is now almost universally established; and if we investigate this new idea of the young scientist on the principles of physics, we find that not only no objection could be raised against the soundness of his theory, but that its practicability is more probable than that of electrical telegraphy was only a short time ago. If the theory should prove a success, electrical telegraphy will attain a position of general usefulness. No special knowledge or apparatus will be required, except a galvanic battery, two suspended plates, and a metal wire. Without any other preparation one person will have to speak into one of the plates, while the other person places the second plate close to his ear, thus enabling them to converse as if in private.

The youthful inventor is confident of the success of his invention, and challenges scientists to prove the impracticability of his theory on scientific grounds. In the meantime the invention fully deserves the attention which will, no doubt, be bestowed on it. L.

When and Why Air Brakes Fail.

Mr. P. H. Griffin, President New York Car Wheel Works, in a letter to the New York *Tribune*, gives the following information and advice:

Without entering into a technical explanation of the subject, it may be said briefly that the brakes are applied through the medium of rod connections, levers, etc., operated by the air brake mechanism. When the brakes are applied, compressed air is admitted into the air cylinder under each car, the piston is moved forward by the pressure, the motion is communicated through the rods, levers, etc., forming the brake connections, until the brake shoes are applied to the wheels.

The air pressure used is about seventy pounds to the square inch. It is manifest that this power, subdivided and applied through eight or more brake shoes, would not be sufficient to stop a train under headway; the power is increased by means of levers in the usual mechanical manner, with the usual result that the movement at the outer ends of the rods and levers, *i. e.*, at the brake shoes, is very much less than it is at the point the power is applied, *i. e.*, the air cylinder.

Some years ago air cylinders were made twelve inches long, but lately this has been increased to fourteen inches; the greater number in use are twelve inches long. When the air pressure is applied to the cylinder, the piston head is moved twelve inches. To obtain the increase in power required to apply the brakes properly, as stated, this movement is decreased to one inch at the brake shoes; thus, when the piston moves twelve inches, the brake shoes move one inch.

If for any cause the piston movement or travel of twelve inches does not apply the brakes, they cannot be applied by the air brake mechanism. The latter may be in perfect order, the operation of applying the brakes be performed either by design or accident, and yet the brakes will not be applied if the piston travel is not properly and effectively communicated to the brake shoes. Under each car will be found from thirty to fifty feet of the rods, levers and connections referred to. They are under severe strain every time the brakes are applied, and are constantly giving and stretching a little in service.

The brake shoes are rapidly worn out through friction with the wheels when brakes are applied; to take up this wear means are provided for shortening the rods and levers. It is not possible to utilize the total movement of one inch at each shoe, for the reason that even that small space represents the total amount available between the maximum application and the greatest relaxation; three-quarters of an inch is about all that can safely be counted on for actual service.

When the connections are adjusted with new brake shoes and everything in proper order, a piston travel of four inches will apply the brakes. As the shoes wear out or the connections give under strain or wear at the pivotal points, the piston travel must necessarily increase to effectively apply the brakes.

The wear of brake shoes is rapid, and the total effective travel of the piston is more than exhausted in the wearing out of one brake shoe. Constant attention must, therefore, be given to the connections to see that they are of proper length, and inspectors at certain points have this work in charge. As a rule the work cannot be done until trains are all made up and ready for departure; the air pressure is then applied, the travel of the piston watched, and if it is too great the connecting rods should be shortened in order that the brakes may be applied with less piston travel, and a margin of safety provided to allow for wear.

The very short time available for this work, the hurry and confusion incident to the departure of trains and the pressure to gain every moment of time in this age of minutes and seconds are serious obstacles to a proper performance of the work; unfortunately, it cannot be done at any other time unless every car is taken to some point provided with apparatus for making a test, a practice almost impossible when the great number of cars in service is considered, as well as the one that drawing room and sleeping cars are often in service constantly for months at a time.

The reports of the Michigan Central Railroad show that 2,316 cars passed Windsor, Ont., in the year 1889, with the pistons of air brake cylinders traveling twelve inches; on such cars absolutely no braking power was obtainable.

Nearly all of these were sleeping cars running through from distant points, the inspection and care of brake attachments being given by different railroad companies. In transferring the cars across the river from Detroit to Windsor and *vice versa*, time was afforded for testing the piston travel and a record taken with the above result. I do not know of any other railroad company making a systematic record of the kind.

During the last year the Michigan Central have equipped their cars with indicators, operating automatically, that show the exact condition of piston travel at all times. When the indicator is used the maximum travel of the piston is always shown, and the necessary alteration to take up wear can be made at any time. From a careful investigation of the subject on many of the leading railroads of the United States and Canada, I have no hesitation in saying that on one-quarter of all cars in service the braking power is so small as to be absolutely useless in case it is necessary to make a sudden stop, for the causes given above.

In every-day practice it can readily be seen that in making the usual stops an engineer can handle his train without difficulty; he knows perfectly the control he has over it, whether a moderate pressure will suffice or whether extra pressure must be used. The latter is always dangerous, through liability to stop and slide wheels, with entire loss of control. But when danger confronts him and he must strain everything to make an immediate and unexpected stop—well, we know they are not always made, and that the difference of a few hundred feet has a terrible result. Investigation follows; it is said that the "air brakes failed to work," and that is the end of it. I firmly believe if the attachments through which the air brake does its work were always in proper condition, accidents from this cause would be very rare.

The conditions of service above explained are in no way attributable to any feature of air brake construction or application. The manufacturers of air brakes have been indefatigable in their efforts to improve and perfect their devices. Without their labors it would be absolutely impossible to run trains at the speeds in practice to-day. It is only just to them, therefore, that accidents so commonly attributed to the failure of the air brakes should be located where they belong, and that every effort be made on the part of railroad managers to supplement the valuable appliances now obtainable with every safeguard that can be found for their effective use.

Oleo in Vermont.

The Vermont legislature has passed an act which will doubtless receive the approval of the governor. It prohibits the manufacture of "any article in imitation or semblance of natural butter or cheese" unless colored pink, and the use of oleo at any public eating house is also prohibited unless it is colored pink. Heavy penalties are imposed for violating the law. Butter is defined as "the product usually known by that name, and which is manufactured exclusively from milk or cream or both, and with or without salt or coloring matter."

It looks as if this new State law probably would be held to be unconstitutional and void. To say nothing of its interference with commerce, it is a prescription as to the manner of preparing an article of food, by which it is adulterated and contaminated. The legislature might as well enact that boiled eggs shall not be eaten in a public restaurant unless the shells are dyed green and the contents pickled in vinegar.

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CURE OF CONSUMPTION—AN INTERVIEW WITH PROFESSOR KOCH.

BY DR. CHARLES HACKS, IN "L'ILLUSTRATION."

"My hour of consultation is between 12 and 1 o'clock," signed "Koch." This is written on a little

Fig. 1.—THE BACILLI OF CONSUMPTION FROM NEW MUCUS EXAMINED UNDER THE MICROSCOPE.

square piece of paper fastened by four pins in a gray frame against the wall at the foot of the grand staircase in the entrance of the Imperial Hygienic Institute, in Berlin, and it was this that four European reporters were studying on the 5th of November, at 9 o'clock in the morning. Alas! what an illusion! Many others have been stopped by that little card, and gone no further. It is not easy, in fact, to reach this celebrated savant. From the porter to the secretaries, every one is extremely reserved in that house. It is almost impossible not to have one's card intercepted before it reaches its destination. We had the good fortune, nevertheless, to overcome all obstacles, and by exceptional favor obtained admission. We are going to try to lift a corner of the veil under which the German sphinx lies hidden, and to show to all the world the great question of the cure of consumption and by what intellectual and experimental processes the present condition of the science has been reached.

The intimate friend and adviser of Dr. Koch received us in his private study on the third floor of the institute. On the door is a little card on which are the words "Dr. Koch." The room is very small, and is partly filled by an enormous stove of faience, which reaches to the ceiling, and opposite to it is a large table covered with green and provided with two drawers. At the end of the room near the window is a little oak bureau, on which we perceived two proofs of photographs of which so much has been said, and which ought to be annexed to the report which is waited for with so much impatience. They represent two forearms with a hand showing the scars of tubercular lesions that have been cured, and photographs of which have been taken from day to day.

Prof. Koch immediately arose and stretched out his hand to me.

"I am very pleased to meet you," said he. "I remember very well our former intercourse at Marseilles at the time of the cholera in 1885. I remember also that you were the first one to translate my works and discoveries, but," and he held my card in his hand, "I guess the cause of your visit, and regret to say that I will not be able to tell you all I would like."

"Nevertheless, "I replied, "the French public wish to know you, and to know and to see something of you and of what relates to your researches. That you will certainly grant me. In the first place, let me ask you for your photograph signed."

I then asked him for a tube containing some bacilli. Prof. Koch passed immediately into a neighboring room and came back holding in his hand a tube containing the *culture*, which he gave to me.

"Will you authorize me to say that these came directly from your laboratory and were given to me by you?'

"You know very well that I am a simple man, and how much I fear the notoriety which has arisen. Nevertheless, you desire it, and I give you the authority."

"Since you are in the vein, what would you think of letting me have a tube of the *culture* of comma bacilli of cholera? You are probably the only person in the world who has the germs of cholera bottled up, and it will be interesting to show as coming from the author of the discovery."

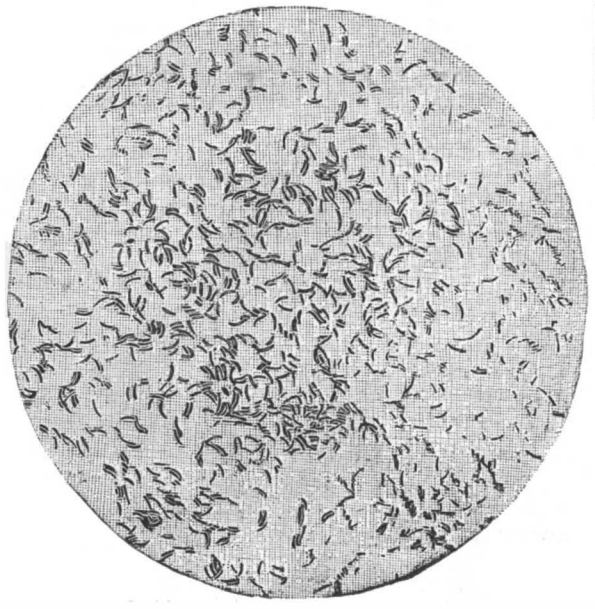

Fig. 3.—THE SIMPLE CULTURE OF BACILLI OF TUBERCULOSIS EXAMINED UNDER THE MICROSCOPE.

"It is not necessary for me to recommend to you the greatest prudence, as these bacilli are virulent.

"Certainly I shall destroy them just as soon as I finish using them. I would like to give photographs of the laboratory."

"As you please. You can have what you wish except the small room at the rear. I am going to ask Dr. Pfeiffer to assist in making photographs of my laboratory of bacteriology, especially that part of it which relates to my work and where my experiments are made. He will give you all the information you need."

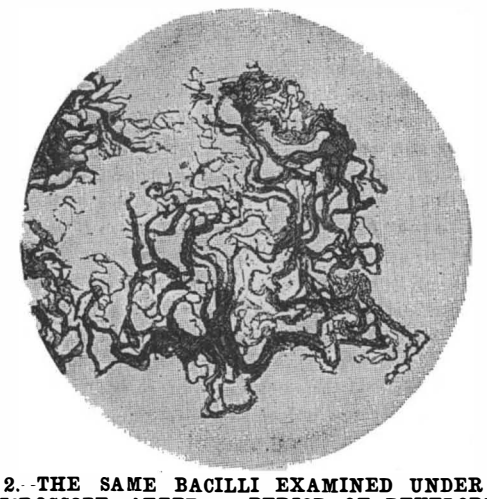

Fig. 2.—THE SAME BACILLI EXAMINED UNDER THE MICROSCOPE AFTER A PERIOD OF DEVELOPMENT OF FOURTEEN DAYS.

Dr. Koch was born December 11, 1843, at Clausthal, where he first attended school. From 1862 to 1866 he studied medicine at Goettingen; then, having become a professor of medicine, he commenced his practice at Posen.

A few years later he was chosen professor and commenced his first work on the study of tuberculosis. He discovered the bacilli, he studied it, and settled the fact that consumption is caused by a bacillus. This work at once put him in the very first rank, so that in 1883 he was sent by the Prussian government to India to make a study of cholera and to discover the cause of that infectious malady. This time again success crowned his efforts, and it is admitted to-day without doubt that cholera is caused by comma bacilli (a name which Dr. Koch himself gave it on account of its resemblance to the comma), as tuberculosis is caused by the Koch bacilli. As a reward for his services, on his return the state voted him a purse of $25,000. The importance of the work of this German savant was thus recognized, and it appears that he is justly entitled to be considered one of the most extraordinary persons of our time. It may be well to mention at this point that according to Koch there is no fear of cholera returning to Europe, or at least it will not pass beyond some of the countries of the South. Berlin with its remarkable system of sewerage, and Paris also, have nothing to fear from that terrible malady. This is certainly reassuring. Thus it may be seen that the object of all of Professor Koch's work is the discovery of the cause of infectious diseases. He is satisfied that what he has done for tuberculosis and cholera, and what others have accomplished for other maladies that are less deadly, such as erysipelas, could also be done

DR. KOCH AT WORK IN HIS LABORATORY.

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for all diseases, whatever they may be. From this it may be seen that his labor on behalf of science is not yet finished. It appears in fact that Koch has for the time being abandoned the examinat on of microbes for that of their destruction in the living human body. It is well known, thanks to him, that consumption is occasioned by microbes whose presence in the lungs, as, for example, in the case of pulmonary tuberculosis, occasions the phenomenon of phthisis. It is useless in treating this disease to repeat the errors of the past by the use of tonics and by telling patients to avoid taking cold, and even, when some new specific has been discovered, to force the patient to swallow it; all this and the use of a hygienic *regime*, and certain remedies resorted to in the treatment of phthisis, have accomplished nothing, and patients continue to suffer and resist the disease a longer or shorter period of time. Dr. Koch abandoned this well-beaten road, he threw aside everything which did not rest upon the solid scientific basis; all the experiments that had been made, from the benzoic acid to the hot air method, all that is an illusion because it is based on a misconception.

Prof. Koch first commenced experiments with a tube which we represent. It is an ordinary test tube, such as is used in all ordinary experiments. It is, in the first place, sterilized over the fire, then a bouillon of sterilized *culture* is poured into it, that is to say, *culture* which does not contain any germ. This bouillon is prepared with agar-agar, a sort of gelatine. When this has been done the microbe, which is taken directly from the mucus of a consumptive, is placed in the tube and the orifice is closed with cotton, thereby permitting the air to pass into the vessel, but retaining the organisms, which are held suspended therein. The tube thus prepared is subjected to an even temperature in an oven. After a certain length of time the microbes begin to develop and increase, and assume the clotted appearance which we see in one of the engravings, and which is one of the characteristic peculiarities of consumption. But in order to experiment effectually it is necessary to have the *culture* absolutely pure, and it is obtained in this manner: In the first place take some of that treated as above and place it in another tube. This is repeated, and after 50 or 60 successive changes of this nature a residuum is obtained which is called pure *culture*, that is to say, it contains absolutely nothing but the microbe which it is desired to study. The pure *culture* of bacilli of tuberculosis is represented in the photograph which we have reproduced, Fig. 3, the negative of which came from the Koch laboratory. It gives perfectly the idea of what may be seen in the field of the microscope. Each one of the black points which are seen in the photograph represents a bacillus, that is, a pathogenic organism, which is the cause of the disease and which was discovered by Koch. It was upon these pure *cultures* that Koch made his first experiments, to try upon each one a long series of chemical reagents, of which the following are the principal: In the series of ethers, etherized oil; of the series of aromatics, *B* naphthaline, para-toluidine, xylidine, fuchsine; among the colors, gentian violet, methylene blue, China yellow, aniline yellow, orimene; of metals, tin, silver, and gold. He found the action upon the last of these the most energetic of all.

It only required one or two millionths of chloro-cyanide of gold to stop all development of bacilli of tuberculosis in pure *culture*. It is seen what an enormous amount of time and trouble was required to make all these tests. Koch saw not only that all the substances which we have cited, but many others with which he experimented—a list of which would be too long for us to give—have the power in a test tube of arresting the development of bacilli of consumption. He had, therefore, finished the first part of his programme in searching for the substances which when mixed with pure *culture* of bacilli of tuberculosis were able to arrest their development. He passed on then to the second part of the programme, viz., experiments upon animals. He selected the guinea pig as a subject, because of all animals this is the most liable to

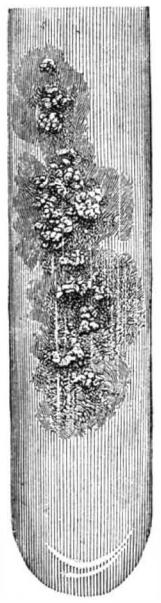

Fig. 5.

Fig. 6.

Fig. 5.—TUBE CONTAINING THE GERMS OF BACILLI OF TUBERCULOSIS FROM THE LABORATORY OF DR. KOCH.

Fig. 6.—TUBE CONTAINING THE GERMS OF COMMA-BACILLI OF CHOLERA FROM THE LABORATORY OF DR. KOCH.

tuberculosis when inoculated. He tried all the substances mentioned in the above list upon the guinea pigs thus rendered consumptive, and he observed that although the action of these substances was so remarkable in the test tube, there was no apparent result when they were applied to the animal. All the inoculated guinea pigs died of consumption. Without being discouraged, however, he undertook a second series of experiments, also upon living animals. He succeeded in discovering a substance (and it is here that the secret begins) which, active in the test tube, preserves its action when it is transferred to the body of the animal. Upon the second series of guinea pigs which had been inoculated, the increase of the bacilli was stopped as soon as the substance was administered, and all were cured. Here it is necessary to rectify an error which the journals have spread. It is known that he made his experiments upon a large number of animals, and every day one of this number disappeared, and it was supposed that it was one of those that had been inoculated. No, it was simply that he killed one from day to day because he wished to follow all the stages that were reached. In all the autopsies it was found that the lesion was stopped as soon as the substance was injected, no matter what stage of development the disease had reached. He was, therefore, able to let a certain number of ex-consumptives live, and they are to-day in a perfect state of health.

It was after these two series of investigations, which were so long, that having arrived at a definite result, he was enabled, before the Congress of Physicians held in Berlin in August last, to make his first communication, which caused so remarkable a sensation. This is what he said in concluding his remarks: "My researches are not yet entirely finished, and I am only able to affirm one thing, viz., that the guinea pig, which is, as every one knows, liable to consumption, became entirely free from it the moment that it had absorbed this substance, and from that moment the disease was arrested and its progress stopped, whatever may have been the stage previously reached, and that also without the constitution being in any way impaired. I am only able to draw one conclusion from these researches, viz., the possibility which exists from this day of paralyzing absolutely the action of the microbes in the animal. It is a new field open to experiment and observation." These were exactly, word for word, the conclusions of Dr. Koch in the month of August last, and it is on a false interpretation, or rather on a premature conclusion, that the idea was created at that time that his researches had attained to the cure of consumption in the case of man. Dr. Koch had not even made allusions to this. It was only later, and following always the idea and the scientific methods which have always guided Dr. Koch, that he began to experiment upon man, guided by the definite results already obtained upon animals and with a feeling of certainty that like results would follow.

With a simple Pravas syringe and drops of the liquid, the consumption disappears and the hectic flush is modified; the patient is cured; and if Dr. Koch is not yet willing to divulge his secret, it is because he is wise in his own opinion, founded on scientific principles, and that he is not willing to leave one iota of error. He was able to kill and to examine his guinea pigs when he wished to know the degree of advance in their cure; but he cannot follow the same course with men. He is no longer experimenting, he is curing. He is obliged to wait until his cure is complete and absolute. When the last of his patients is a well man, he will speak, and we shall know all. Before then he will say nothing. This is the cause of his delay in satisfying a public curious and anxious to know all. These are the sorts of discoveries that open up the infinite horizons of science and elevate to the highest pinnacle the one who has conducted the experiments; and one is compelled to respect the true savant, who fears notoriety, and who will quietly and modestly bestow, some day, this cure upon humanity, without any recompense (in spite of offers of all kinds, which come to him from every side), without any other profit than adding one more leaf to the already beautiful crown of that modern science of which the French genius, in the person of the great Pasteur, has furnished the elements, founded the principles, and brought about such magnificent results.

ROBERT KOCH, DISCOVERER OF THE CURE OF CONSUMPTION.

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SAFE CONSTRUCTION OF BUILDINGS.

At the last great fire in Boston, some of the modern fireproof structures actually crumbled from intense heat, while iron roofs were gradually expanded until the walls were forced apart, permitting the whole structure to collapse. It is said that 80 per cent of all fires are extinguished where the loss falls below $100, and where the loss passes this amount the damage is very likely not to stop short of total destruction of the premises and those adjoining. The total loss by fire last year was computed at $125,000,000; $75,000,000 representing the loss where fire originated on the premises, and $50,000,000 the loss that was caused wholly by exposure, that is where fire was communicated from adjoining buildings.

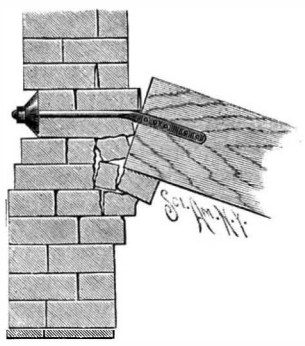

Fig. 1.

The method of anchoring a building is one of the most important items in its construction, but proper anchoring is very often neglected. The method usually practiced consists of fastening an iron strap to the sides of the joist, and securely building the same into the wall. In case of fire the joist quickly burns through, and, in falling, the metal strap cannot free itself from the wall, and either pulls the wall along, as shown in Fig. 1, or else makes a breach, so fire can pass through to the next building. In addition to this, defective flues ignite the joist ends, and careless builders sometimes permit joists to overlap each other, when resting on a party wall.

The Goetz-Mitchell method of anchoring joists is designed to obviate these serious defects. The falling joists free the anchorage and leave the walls standing.

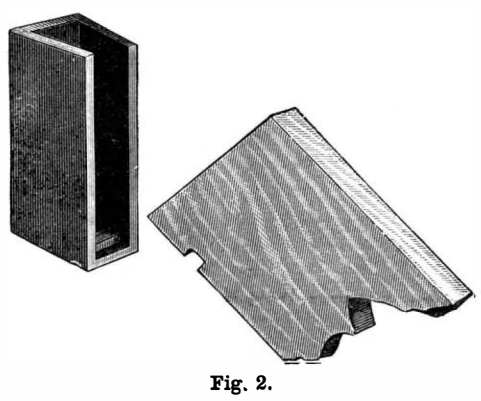

Fig. 2.

By the ventilation provided at the sides, it also prevents the rotting of the ends of the joists. A greater weight upon the beam increases the bondage of this anchor. This joist anchor (see Fig. 2) consists of a dovetail form cast iron box, which is built into the wall, its form securely holding it in position. A notch on the bottom edge of the joist fits over a lug in the box, and thereby forms the tie between the opposite walls. In case of fire, the joists, in falling, free themselves from the lug and have no tendency to pull the walls down. When used on every fifth joist the method costs no more than the old style strap and star. The device can be arranged for iron beams, forming a secure anchorage and also a safe bed plate.

Fig. 3 shows the anchor arranged with air spaces at the sides so as to provide air for the heavy timber ends, preventing dry rot, which is so liable to occur whenever heavy timbers are excluded from the air or covered with air-tight material. Beams are frequently sealed so tightly where they enter the wall that dry rot takes place in the walls while the exposed portion of the beam within the room is entirely sound.

An architect's aim should be to so construct his building that the entire interior of the structure might be destroyed, but without damage to the exterior walls. The Goetz-Mitchell methods are designed to accomplish this; for should the joist upon one side of a building burn and fall, then those upon the other side would be holding the wall in position (see Fig. 4). The main object of the method is to keep the fire and partition walls erect during a fire, for nothing can resist the spread of fire so well as a standing brick wall.

Fig. 5 illustrates another improvement in the way of a timber cap arranged so that any burnt or defective parts can fall out of their respective positions, but without bringing down adjacent parts. The advantages are, they are easily put up, prevent crushing of timbers when loaded, and prevent vibration of building, because the bases of columns are securely fastened. They save 12 inches in length on the long lengths of timbers, and all parts are securely held together, and still any horizontal timber can fall without damage to the sustaining posts. The cap being bolted to the upper column will carry the horizontal timbers, should the sustaining post be destroyed. Nearly twenty buildings have so far been supplied with the new Goetz-Mitchell anchors. For further particulars address the company, 78 State St., New Albany, Indiana.

A Successful Case of Transfusion.

It is always a pleasing duty to have to record examples of devotion to the welfare of their patients on the part of medical men; and although but few such instances are ever recorded, they would, if published, form a long catalogue. Such an instance earned the just encomiums of the *Hull Examiner* in a recent number, where we find mention of the success attending the transfusion in a patient who had apparently been attacked by internal hemorrhage, the operator himself giving the blood. Although, very properly, our lay contemporary does not give the name of the operator who thus distinguished himself for his humanity and skill, there can be no objection to our stating that it was Mr. Robert Hagyard. We are also enabled to give some details of the case. It was one of cancer of the breast, which had been removed ten days before by Mr. Hagyard. While the wound was being dressed the patient was suddenly attacked by syncope. She became pallid and completely collapsed—a condition not to be accounted for by the fact that she was the subject of mitral disease. After the subcutaneous injections of brandy and ether, and the performance of artificial respiration, Mr. Hagyard decided to have recourse to transfusion. This was effected by means of Aveling's apparatus, the blood being taken from his right arm (he is left handed) and injected directly into the patient's veins. It was calculated that more than a pint of blood was transfused, the operation being terminated by the operator becoming faint. The result was most satisfactory, for at the end of ten minutes the patient had completely recovered, and in a few days was able to leave the hospital. The cause of the collapse was thought to be internal hemorrhage, as on the following day the motions were observed to be blackened. There is no doubt that the patient owes her life to Mr. Hagyard's prompt and courageous act, which he had to perform with only the assistance of a nurse. It may be remembered that a similar instance of a surgeon resuscitating a woman suffering from puerperal hemorrhage by transfusing blood from his own arm was recorded a few years back from a Hampshire village; and we may recall the statement of Professor Von Nussbaum (who, we regret to learn, is seriously ill) that he had given blood for this purpose no less than ten times.—*The Lancet.*

Liquor Decision by the Supreme Court.

Mr. Christensen, of San Francisco, having for several years kept a liquor saloon in that city, applied for a renewal of his license in 1889, but was refused by the police commissioners on the ground of keeping a place of bad repute. He continued to sell without license, and was arrested, but he appealed to the United States Circuit Court and was discharged on the ground that the liquor law was unconstitutional. This decision the Supreme Court of the United States now overrules, thus maintaining the rights of States and communities to suppress or regulate the sale of liquors for drinking purposes.

In stating the grounds for its decision, the court says that it is undoubtedly true that it is the right of every citizen to pursue any lawful business, subject only to such restrictions as are imposed upon all persons of the same age, sex, or condition, but that the possession and enjoyment of this right, and, indeed, of all rights, are subject to such restrictions as may be deemed by the governing authority essential to the safety, health, peace, good order and morals of the community. Even liberty itself, the court says, is not unrestricted license to act according to one's own will, but is only freedom from restraint under conditions essential to the enjoyment of the same right by others. Regulations of the liquor traffic are only a part of a great body of rules varying with the nature of the businesses regulated, and their validity is to be decided on like general principles. Continuing, the court says:

It is urged that, as the liquors are used as a beverage and the injury following them if taken in excess is voluntarily inflicted and is confined to the party offending, their sale should be without restrictions, the contention being that what a man shall drink equally with what he shall eat is not properly matter for legislation.

There is in this position an assumption of a fact which does not exist, that when the liquors are taken

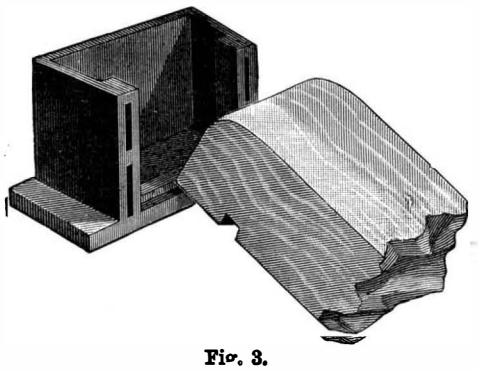

Fig. 3.

in excess the injuries are confined to the party offending. The injury, it is true, first falls upon him in his health, which the habit undermines; in his morals, which it weakens, and in the self-abasement which it creates. But as it leads to neglect of business and waste of property and general demoralization, it affects those who are immediately connected with and dependent upon him. . . . The sale of such liquors in this way [in small quantities to be drunk at the time] has therefore been at all times considered the proper subject of legislative regulation. For that matter, their sale by the glass may be absolutely prohibited. It is a question of public expediency and public morality, and not of federal law.

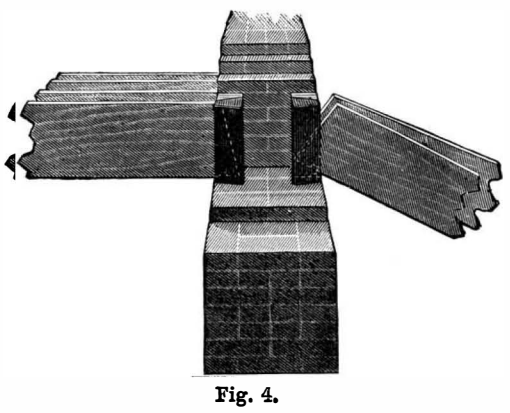

Fig. 4.

There is no inherent right of a citizen to sell intoxicating liquors by retail, it is not a privilege of a citizen of the State or of a citizen of the United States. In the prohibition or regulation of the traffic discretion may be vested in officers to decide to whom to grant and to whom to refuse liquor licenses. The officers may not always exercise the power conferred upon them with wisdom or justice to the parties affected, but that is a matter which does not affect the authority of the State, or one which can be brought under the cognizance of the courts of the United States.

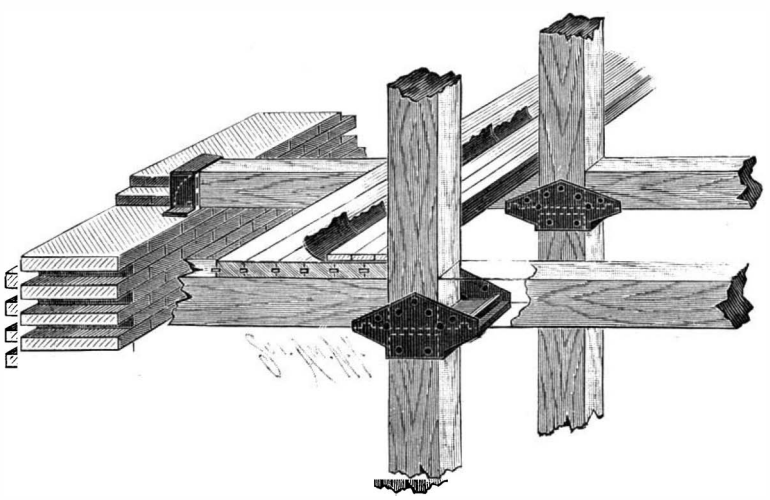

Fig. 5.

A Mammoth Steel Bridge.

According to the Philadelphia *Telegraph*, the great steel bridge across the Columbia River, at Vancouver, will be a mammoth concern. It will be 6,000 feet from the Washington to the Oregon shore. It will be double tracked, with a road way on top for teams, and will be erected upon pneumatic piers. The pivoted pier, or draw pier, will support a draw which will give an opening of 200 feet space on either side for vessels to pass, and the span immediately south of the draw span will be 375 feet. The whole structure is to be of steel, built 10 feet above the high water of 1876, and 40 feet above low water. On account of the sandy formation it will be necessary to go down 80 feet below low water to get a firm foundation. There it rests on a foundation of coarse gravel similar to that upon which the great bridges across the Missouri River are built. This gigantic structure will cost over $1,000,000 and employ hundreds of men in its erection. It will be January 1, 1892, before the cars can pass over it. The company is pushing its bridge and also its road as fast as men and money and its present perfected plans will permit. They have now between Vancouver and Kalama over 2,000 men and 1,500 teams at work.

THE balloon proposed for polar explorations is ninety-nine feet in diameter and 500,000 cubic feet in volume. The journey will be from Spitzbergen, and with a favorable wind will last four or five days,

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Highest North American Peaks.*

Among the objects for which the expedition recently organized under the auspices of the Academy of Natural Sciences, of Philadelphia, was dispatched to Mexico was the determination of the physical features of the giant volcanoes of the south, with special reference to a study of the vertical distribution of animal and vegetable forms. While prosecuting our observations in this direction, I took the opportunity, in company with one or more of my associates, of scaling the four loftiest summits of the land; namely, the peak of Orizaba, Popocatepetl, Ixtaccihuatl, and the Nevado de Toluca. This gave me the advantage of making personal comparisons between the life that existed in different regions of "cloud land," at the same time that it offered me the opportunity of more closely investigating the geological features of some of the most gigantic volcanic mountains known to us. Numerous measurements of altitude were made during the ascents, and, in the higher regions, always with the same instrument. This was a registered aneroid, tested and corrected at Philadelphia (immediately before the starting, and shortly after the return of the expedition), at the sea level of Vera Cruz, and in the Central Meteorological Observatory of the city of Mexico, at an elevation of 7,403 feet. To the officers of the latter institution I am indebted for the privilege of making comparisons with the standard mercurial column.

The results of our measurements show a striking accord in some instances with those obtained from earlier measurements, while in other cases they exhibit marked divergence. The fact that all the summits were ascended within a period of three weeks, were measured with the same instrument, and during a period of atmospheric equability which is offered to an unusual degree by a tropical dry season, renders the possibility of errors of any magnitude almost *nil*. At any rate, such errors as may have crept in will probably not affect a general comparative result. The points of important difference are: 1. The highest summit of Mexico is not, as is commonly supposed, Popocatepetl, but the peak of Orizaba (Citlaltepetl, the "Star Mountain"), which rises 700 feet higher (18,200 feet). 2. Ixtaccihuatl, the familiar "White Woman" of the plain of Anahuac, is but a few hundred feet (about 550) lower than Popocatepetl.

The peak of Orizaba was ascended on the 6th and 7th of April, Popocatepetl on the 16th and 17th of the same month, the Nevado de Toluca on the 21st, and Ixtaccihuatl on the 26th and 27th.

The restoration of the peak of Orizaba to the first place among Mexican mountains, and its increased altitude, open up the interesting question as to what constitutes the culminating point of the North American continent. The only other mountain that need be considered in this connection is St. Elias, situated approximately on the 141st meridian of west longitude, and whose summit is claimed for both the possessions of Great Britain and the United States (Alaska). The measurements of this mountain depart so widely from one another, however, that we are not yet in a position to affirm, even within limits of a thousand feet or considerably more, how nearly it approaches in height the Mexican volcanoes. ANGELO HEILPRIN.

The Man with a Patent.

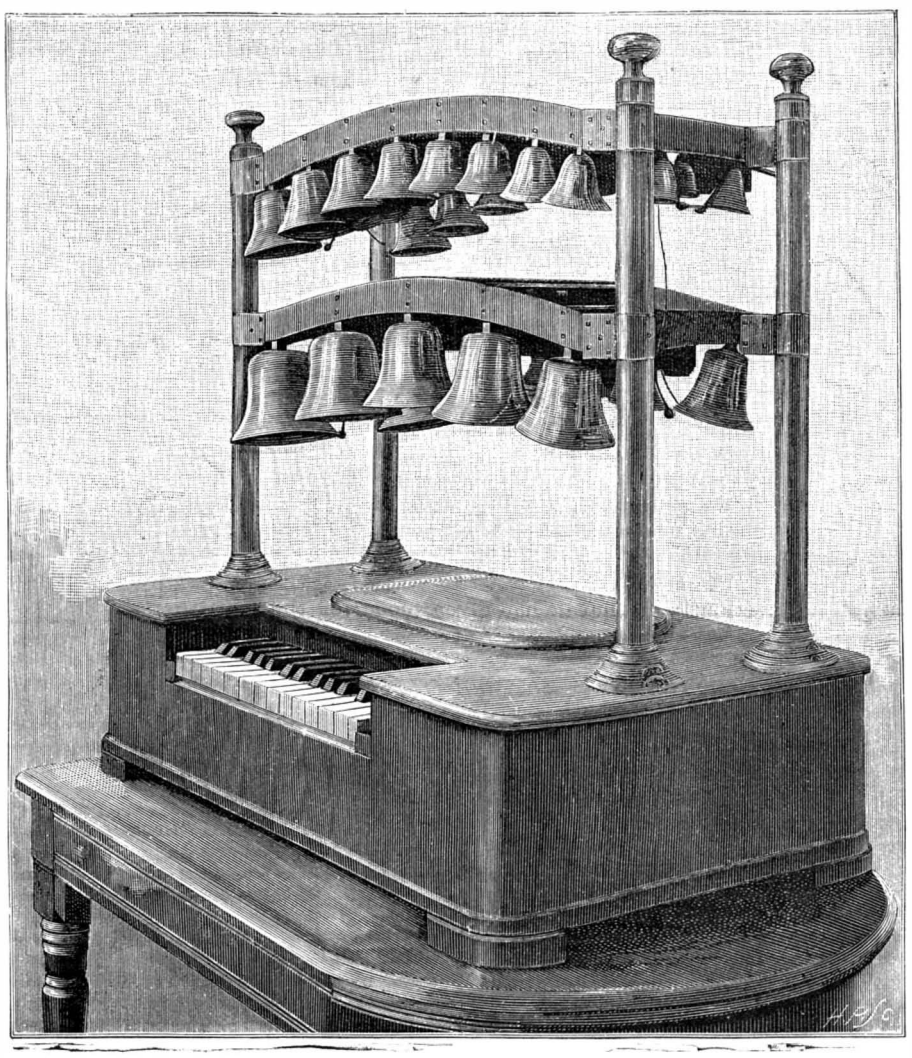
The New York *Sun* relates the following story: 'There were only half a dozen people in the palace car all day long, and after dinner, when the man who had been sleeping and reading in seat No. 12 came over to me for a chat, I welcomed him with open arms. He said his name was Saunders, and that he had a patent or improvement on some part of a locomotive. He was going through to Cincinnati to have it perfected or adopted, or something of the sort. He had been in partnership with a mean man—a man who had tried to swindle him out of a fortune. To get even, he had stolen the patent and run away. He had it with him in a valise. That was all he said just then, but later on he confided to me the fact that at a town about 30 miles away this wicked partner of his might possibly be on hand to board the train and attempt to wrest the treasure from his keeping. He wanted my advice, and I offered to take charge of the valise. He thanked me with great effusiveness, and as we approached the town he shut himself into the smoking compartment.

"As the train drew up I saw an old acquaintance on the platform, and while we were talking a posse was hunting the train for my friend. They didn't find him, as he had dropped off and struck out for the country. I went on to Cincinnati, taking his valise along, and although I was there four days he didn't show up. I arranged to leave it with the landlord, and it was carried to the office, to be opened by a meddlesome clerk. Instead of a patent, it contained wedges, drills, a brace, fuse, and other neat little devices for successfully working a burglar's job, and it cost me two days of the hardest kind of talk to satisfy the chief of police that I wasn't in it. I had ridden over 100 miles with a full-fledged burglar, and one who had made his mark, and I must say he was a better talker and more of a gentleman than any governor I ever met."

* From the proceedings of the Academy of Natural Sciences, of Philadelphia.

ELECTRIC CHIMES.

Dr. Alva Owens, of Chicago, recently constructed the somewhat unique musical instrument shown in the illustration. The apparatus, which might be described as a set of chimes to be rung by electricity, was designed for advertising purposes. The instrument, it is intended, will be carried through the streets on an electric tricycle and will be played on the trip after the manner of an ordinary piano. The details and operation of the device are so simple as to require but little explanation: Attached to each of the thirty bells hung on the rack above the key-board is an electro-magnet. The keys make the circuit from a battery in the base to the electro-magnets at the bells.—*Western Electrician.*



ELECTRIC CHIMES.

Iron Ore Discovered by Lightning Strokes.

Commenting upon a report that a house in Ohio, supposed to be situated over a bed of iron ore, has been struck by lightning eight times within three years, a writer in the Chicago *Journal of Commerce* says: The truth is that all iron ore deposits are not confined to the several well known localities of the United States where they most abound. If careful observation was made, undoubtedly many new fields might be opened up in places where the presence of iron is not suspected. The writer, in his youth, lived on a farm in Southern Wisconsin, on two acres of which lightning had struck, it was estimated, at least forty trees. No sane man could for one moment suppose that the stricken trees of themselves possessed sufficient metallic attraction for the lightning to single them out for destruction. The suggestion made at the time, that underneath these two acres was a bed of iron ore, has never been effaced; yet it is doubtful if ever any other person noticed the peculiarities of that particular plat of ground.

Nature seldom errs in her indications of mineral wealth, and makes electricity a prominent agent in determining the location of iron deposits near the surface. Hence if a forest at any point shows unusual effects of lightning, or if a house becomes a peculiar attraction for it, it might pay to engage an experienced prospector to develop the hidden ore.

Selections of Building Materials.

In preparing plans for a new structure, says the *Carpenter and Joiner*, the most important matter to decide upon is the selection of the material. This, to a large extent, is determined by its cost, but not to so great an extent as might at first be imagined. It is to be taken for granted that an architect will build his structure of the best material his cost limit will permit. Now, this does not mean always the costliest material, although the public are apt to think so; but if the designer be a man of fine taste and well trained in his art, he will select a material that, while essentially durable, will confessedly subserve the best effect. Effect is a prime cause with every architect who has a genuine love for his art, and to a large extent is the dominant feeling in his design, but he still has a wholesome respect for a material that is admittedly substantial and durable.

If the new structure is a public building, he will naturally choose stone in preference to brick for his external walls, because with stone he can obtain a more noble and dignified effect. With stone, too, he can obtain a much more beautiful and permanent color scheme, and if the structure will admit of decoration, he can obtain, more closely, a better interpretation of his designs than is now possible in brick or terra cotta. Public buildings demand dignity and repose and simplicity of coloring, and stone, as a material, offers the proper medium of expression. As to stone itself, great care and considerable knowledge of its structure is required to enable an architect to make a proper selection.

Considerations governing the choice of material exist naturally in the purpose of the proposed structure, its geographical location and its situation with respect to adjoining or contiguous structures. In addition to these, a further condition is imposed on its selection by a circumstance which we have reason to believe is seldom thought of, namely, the character of the coal burned in its immediate vicinity. In a district where soft coal is used largely for manufacturing purposes it is impossible to use a coarse, white stone, such as granite, marble or limestone, because soot becomes deposited on its roughened faces, and darkens and ultimately blackens the entire stonework to such an extent as to destroy its original expression. Where the use of soft coal prevails so as to become detrimental to the beauty of stonework, it is necessary to resort to brick and terra cotta work, because they are not injured so readily as stonework. Where granite is to be used it is advisable to employ it in such a manner that it will not be damaged by fire from other buildings. This can be done only by strict isolation, and would relegate granite to isolated public buildings. For office buildings, built close to adjoining structures, it is evidently quite unsuitable. Granite-faced structures are often built of one uniform tone as to color, and the effect is cold and harsh. This practice has prevailed in the past, but it is gratifying at the present time to observe a marked change in this regard. Dark-colored granites are now used for lower stories, upon which are imposed stories lighter in color as the crowning cornice is approached. This choice is in keeping both with the proper expression of stability and of aerial perspective.

Where brick is chosen for the sake of its inviting field as to color, it is necessary to use the utmost care in selecting not only materials but color. Brickmakers, with good judgment and taste, owing, we believe, to the urgent demands of architects and their clients, have been making marked innovations not only in the color of brick, but in their forms. Bricks 12 inches long, 1½ inch to 1¼ inch face, are now made. Other irregular sizes are obtainable, and in addition to this, rock-faced stonework has been imitated by rough-faced brick. This roughing face is a moulded face, and when used in a climate or locality free from soft coal smoke, it can be used to great advantage. It is a mistake, however, to suppose that artistic brickwork is cheaper than desirable stonework. The choice of either at the same cost is dependent, to a large extent, on the capability of the designer. Some men have a positive talent in designing brickwork which will be exquisite in its refinement of line and its delicate glow of color. In every case permanent effect is the ultimate aim, and can be obtained only by an almost encyclopedic array of information which has been carefully classified and fully studied.

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RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ENGINE VALVE.—Joshua Rose, Twickenham, England. This invention relates to slide valves, and provides for prolonging the period of the expansion of the propelling fluid for all points of the cut-off in engines whose steam admission is effected or controlled by a single valve, by allowing the steam, during certain periods of the valve travel, to hold one part of the valve stationary on its seat while the other part of the valve is actuated positively, the invention also covering other novel features.

Railway Appliances.

RAIL. — Michael A. Glynn, Havana, Cuba. This rail is made with a scalloped flange, and is adapted for use in connection with a sleeper having a transverse dovetail slot to fit the widened portions of the rail flange, whereby the rails and sleepers may be quickly adjusted in position, and will not be liable to be accidentally displaced.

Mechanical.

WINDER FOR SPINNING SPINDLES.—Ernst Gessner, Aue, Germany. This invention covers an improved form of the guiding piece of winders in continuous spinning machines forming the subject of a former patent issued to the same inventor, so as to make the winder of as little weight as possible to make it capable of running at a high speed.

NIPPLE HOLDER.—Daniel A. Holland, Boston, Mass. This invention provides means whereby a section of pipe from which the nipple is to be cut may be firmly held to place while the completion of the nipple is being effected, while the device is so constructed that the nipple when finished may be conveniently removed in perfect shape.

Agricultural.

CULTIVATOR AND PULVERIZER. — Charles C. Crumb, Burlingame, Kansas. This is an implement designed to remove all weeds from the surface of the ground, and pulverize and leave the soil fine and mellow, the pulverizing or cultivating surfaces being interchangeably arranged, permitting the soil to be thrown toward or away from the plants, and the machine being quickly adapted to any irregularities in the depth of the rows.

Miscellaneous.

ALBUM.—Thomas Kelly, New York City. This is a device consisting of a hollow base with compartments closed by a lid, the latter supporting the book containing the pictures, affording a secret drawer for loose pictures, while one of the covers can be used as a writing desk.

THILL COUPLING. — Olaus A. Dahl, Mona, Iowa. The thill iron of this coupling is pivoted upon conical bearings capable of being readily oiled, while the parts may be easily tightened when worn, the construction being simple, durable and economical, and the coupling being also a thorough anti-rattler.

WHIP SOCKET SUPPORT. — Alexander E. Tulloch, Leadville, Col. A bracket with a stem having an integral lateral flange is provided by this invention, the flange being downwardly bent and split in its end portion, making a simple and neat bracket support for the attachment of a whip socket to a vehicle body or seat.

TANNER'S TOOL. — Robert H. Houk, Morris, Ill. This invention covers a novel form of clamping device adapted to hold hides of different thicknesses for suspension in the tan pits or elsewhere, the points of the jaws being arranged to come together to hold the hide without cutting a hole therein, whereby the necessity of cutting loops or punching holes in the hides is avoided.

TRICYCLE. — Frank Searle, Virginia City, Montana. This invention covers a novel construction and combination of parts in a machine designed to be very powerful, and to be readily propelled by the operator manipulating crank arms with the hands, the steering being accomplished by the feet of the rider.

BLACKING BRUSH. — James S. Moore, Bar Harbor, Me. This brush is so made that the blacking may be located in its back and completely hidden from view when not in use, means being also provided for conveniently drawing the blacking out from the back of the brush, without its being detached, and for its effective application in a neat and convenient manner to the dauber.

CARBONIZING APPARATUS. — Adolf Silverberg and Cunibert Detering, Bedburg, Germany. Combined with a revolving drum and hollow shaft, to which is fixed a retort, under which is a fireplace, is an acid receptacle, a tube from which opens into the retort, whereby the quantity of acid introduced may be regulated as desired and the vaporized acids will be prevented from escaping.

STRINGED MUSICAL INSTRUMENT. — George W. Van Dusen, Norwood, N. Y. This invention covers novel features of construction of string supports relatively to the plate or frame and sounding board of the instrument, being applicable more particularly to pianos, and designed to maintain perfect pitch and harmony of tone from the strings, irrespective of changes of temperature or long-continued use of the instrument.

MAIL INDICATOR AND ADVERTISING BOARD.—Thomas B. Peacock, Topeka, Kansas. This is a board with movable slides for advertisements, while embedded intermediately in the board is a box with a transparent front wheel, a series of cubical blocks having different letters on their faces being arranged in the box to indicate undelivered mail.

KEY BOARD ATTACHMENT. — Casper De Vilbiss, Shellsburg, Iowa. This is a device to be removably attached to any cabinet organ or piano, to furnish means for the mechanical execution of any tune the attachment is adapted to play by periodical movement of the keys of the musical instrument.

COPY PRESS.—Richard A. Brown, New York City. Combined with a bed on which a platen is held to slide is a hollow slotted paper-carrying cylinder with an exterior pad adapted to contact with the platen, the press giving the impression of a letter by one revolution of a crank arm, while the cylinder will carry a stock of copying paper, which is automatically dampened and cut to a proper length as the impression is taken.

AUTOMATIC GATE.—Alibert Edwards, Lanesville, Va. This is more particularly a roadway gate, of simple and inexpensive construction, to be easily operated by a passing vehicle or by a person riding on horseback, the devices patented being also applicable for use with railroad gates by placing the triggers provided adjacent to the track to be operated by the car wheels.

WIRE FENCE AND FENCE POST. — Samuel H. Gregg, Crawfordsville, Ind. Three patents have been granted this inventor on the above subject, the improvements combining in one fence some of the advantages of both a barbed and smooth wire fence, and avoiding the objectionable features of both. The strands are made of unannealed spring wire, preferably spring steel, but the wire is crimped to make it more plainly visible, and also to allow for expansion and contraction, while between the posts are stays usually arranged about five feet apart, and secured to anchor posts or plates driven into the ground. The terminal posts are designed to be made at a small cost and easily set in place, while their peculiar construction is such as to admit of the ready connection therewith of simple wire-tightener means, which can be readily put in position and detached from the post.

HOOP FOR COOPERS' WARE.—Leonard L. Frost, Barada, Neb. This hoop has at one edge an inwardly projecting portion or flute and a plain opposite edge, the lower edge of the hoop being designed to rest in yielding contact with the face of the receptacle in connection with which it is employed, being more especially designed for use with pails and tubs.

HOGSHEAD MAKING MACHINE. — Robert E. King, Louisburg, N. C. This machine has a central bed piece to which horizontal semicircular formers are hinged carrying at their free ends fastening and compressing devices, the machine requiring but little skill in adjusting the staves, and being one in which it is impossible for the staves to collapse while hooping the hogshead.

SINGLETREE SUPPORT. — Robert C. Allen, Grove City, Pa. This invention consists of a block adapted to carry the singletree, a strap for supporting the block from the cross bar of the shafts, and arms connected with the block and pivoted on the axle of the vehicle, the device being specially designed for one-horse vehicles having bent shafts, and calculated to relieve the animal from all strain on its back.

WARDROBE TRUNK.—Sarah M. McCormack, Cold Spring, N. Y. This is a combined wardrobe and trunk, having two sections hinged together at the top, each section provided with shelves and drawers, and an elastic packing strip being secured to the outer surface of the sections and extending across the top above the joint between them.

OVERALLS. — Isaac M. Appel, Baltimore, Md. Two patents have been granted this inventor, the garment having the front portion of the leg folded upon itself above and below the knee, forming triple thicknesses at and adjacent to the knee portion in front, but not showing upon the outside, while there are also knee re-enforce pieces, forming also braces, which can be readily cut and easily applied, made with strips of different lengths to fit different sizes of overalls.

SCISSORS SHARPENER. — Wales E. Woodruff, Essex, Conn. This device has a box clamp with a seat or recess in its top for a file, the seat being beveled to the angle usually given to the cutting edge of scissors or shears blades, while a top plate has a bearing coinciding with that of the seat, the outer edge of the top plate forming a straight edge or guide for the blade.

CONVERTIBLE FURNITURE.—Frank A. Thomas, Brooklyn, N. Y. This invention provides an article of furniture designed to be used as a chair, cradle, or lounge, at pleasure, there being a main body and a sliding section, each composed of intermeshing sliding slats at the back and bottom, with a removable back section to form the front of the cradle, and means for preventing accidental extension and detachment of the parts.

WINDOW SHADE AND CURTAIN POLE. —Rinaldo A. Bat-te, Norfolk, Neb. This invention covers a novel construction and combination of parts providing a simple and efficient window shade support, with peculiar means for adjustment of the shade thereon, and also affording a bracket on which the hangers of a curtain pole may be held.

EGG BOILING DEVICE. — Jacob Verdam, Alkmaar, Holland. This device consists of loosely connected vertical wire links and a yoke loosely suspended thereby and having rings at its ends, for holding or retaining eggs while being boiled in a kettle.

HOUSEHOLD WATER HEATER.—Henry C. Steinhoff, Union, N. J. This is an attachment for stoves or kitchen ranges, consisting of an efficient system of water pipes applied independently of the ordinary water back, and adapted to heat water and maintain its circulation through radiators, no change being required from the ordinary setting, and the device being operated by the manipulation of a damper.

HAND FOR DOLLS. — Matthew W. Alderson, Bozeman, Montana. According to this invention the hands of the doll are preferably made integral with hollow forearms of a jointed arm, combined with which is a pivotally mounted finger section and an elastic cord extending through the arm and normally holding the fingers closed by its tension, permitting the doll's hands to hold articles.

COMPLEXION MASK. — Nettie E. Jenkins, Auburn, N. Y. This is a medicated mask or glove of purely vegetable substances, designed to heal, purify, soften, and beautify the skin, and is made of a compound possessing the merits of rubber, yet free from the disadvantages attending the use of that material.

LEATHER DRESSING.—John M. Jolly, Marlin, Texas. This is a stuffing or filling compound in which are employed neat's foot oil, beeswax, extract of logwood, borax, castile soap, and other ingredients, in specified proportions, in order to soften and polish as well as preserve leather, being particularly applicable as a dressing for harness, boots and shoes, etc.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ELECTRO-CHEMICAL ANALYSIS. By Edgar F. Smith. Philadelphia: Blakiston, Son & Co. 1890. Pp. 116. Price $1.

This work is exactly what it purports to be, a laboratory guide for the utilization of the electric current in analysis. Under each metal is given a brief extract of the literature relating to its analytical determination by electricity, so that the work, small and compact as it is, is really of very great value, and embodies all leading authorities. It has numerous illustrations which add to its attractiveness.

A SISTER'S LOVE. By W. Heimburg. Translated by Margaret P. Waterman. Illustrated. New York: Worthington Co. 1890. Pp. 319.

This novel, in printing, binding, and numerous illustrations, fully maintains the high standing which the Worthington series of novels has won in the publishers' world.

A BOY'S HISTORY OF THE UNITED STATES. Worthington & Co., New York. Price 50 cents.

A RUSSIAN COUNTRY HOUSE. Translated from the German. Illustrated. Worthington & Co., New York.

INCANDESCENT ELECTRIC LIGHTING. A description of the Edison system. D. Van Nostrand & Co., New York. Price 50 cents.

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DECEMBER NUMBER.—(No. 62.)

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7. An attractive cottage in Buena Park, Chicago. Estimated cost $4,500. Photographic view and two floor plans.
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10. A picturesque example of a bungalow at Bellagio. Cost £900. R. A. Briggs, London, architect. Plans and elevation.
11. Attractive country house at Narberth Park, Pa. Cost complete $18,000. Two photographic views and floor plans.
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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Wanted—A first class foreman for our general wrought iron shops. Must be thoroughly competent and experienced in iron and steel roof, truss, and bridge work. Permanent situation to the right man. Address, stating experience and references, Scherpe & Koken Architectural Iron Co., St. Louis, Mo.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2610) H. E. McC. asks how to tan calf skins thoroughly on both sides by the use of chemicals or otherwise, and produce the best results. A. You cannot learn how to tan calfskins well by any treatise or book. It is a technical trade requiring knowledge, experience and acquired skill. We sell a large, fully illustrated book, Davis on "Tanning," containing much information on the making of calfskins and other kinds of leather. Price $10 by mail, postage paid.

(2611) W. H. D. asks: Would you kindly inform me through your paper what kind and size battery to use on silver plating solution? A. Use four or six cells of Bunsen battery. See SUPPLEMENT, No. 310.

(2612) A. M. F. asks: What is the whitish powder that adheres to rubber belting and uncolored rubber goods in general, when new, and what is its use in rubber making? A. Talc or some equivalent used to prevent India rubber adhering to the moulds in which it is vulcanized.

(2613) C. A. S. asks: What ingredients would you recommend for hardening and waterproofing mechanically ground wood pulp? A. We would suggest a solution of shellac in wood alcohol.

(2614) R. A. asks: 1. What causes the foliage to change color in the autumn? Is it a chemical change? A. It is a chemical change. 2. How many elements are there at present known? A. 67; but the number may be modified at any time from new investigations. 3. Is not the idea of sight without light erroneous, that is, can a cat or any other animal see in the dark, and what makes their eyes appear luminous in apparent darkness? A. There must be some light for sight to exist. A cat's eyes reflect light. In absolute darkness they are invisible. 4. What form of battery (and how constructed) is best for a small pocket battery used for running an incandescent electric light scarf pin? A. Use a small storage battery, which is best bought. 5. What battery is best for doing small jobs of gold, silver and copper plating (two or three pints of solution), also for nickel plating? What are some of the best books on electro-metallurgy? A. Smee or Daniell batteries are good. See SUPPLEMENT No. 310. We recommend Watt's "Electro-Deposition of Metals," $3.50. 6. What takes place when soldering (both hard and soft solder)? Is an alloy a mechanical or a chemical combination? A. An alloy is supposed to be formed with the surface of the metal united. The exact status of an alloy is hard to fix. It probably partakes of both characters. 7. How can rubber (such as rubber bands, etc.), be united? A. If unvulcanized, by simply cutting

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and pressing together the fresh surfaces. Otherwise it cannot be satisfactorily done. 8. How can I get a price list of chemicals? A. Address any wholesale drug house.

(2615) G. A. asks: 1. What is the highest altitude ever reached by a rarefied air balloon, and also a gas balloon? A. Accurate data are not obtainable for rarefied air balloons. In Coxwell and Glaisher's famous a cent. of September 5, 1862, with a gas balloon, the height of 37,000 feet was probably attained. This is the highest altitude ever reached. 2. Can you recommend me to some good articles on aeronautics and balloon making? A. We refer you to our SUPPLEMENT, Nos. 726 and 249, and for an excellent illustrated account of the history of ballooning to our SUPPLEMENT, Nos. 738 and 739. 3. Is there any school on the Pacific coast where aeronautical engineering is taught? A. No. 4. Can you supply me with a book on the subject? A. We can supply May's Ballooning, $1. The book you mention in your letter is out of print.

(2616) J. G. H. writes: 1. I want to make an electrophorus as mentioned in "Experimental Science." Instead using a vulcanite disk, I want to make one composed of resin, shellac, and Venetian turpentine. Please let me know the proportions, how to go about making it, also is there any danger of explosion from the turpentine? A. Use 6 parts of resin, 4 of shellac, and 1 of Venice turpentine. Work at a low heat; there will be some danger of fire. 2. What kind of battery is the most useful for one who wants to make different electrical experiments? A. Probably a plunging bichromate battery would suit your purpose. The bottle form commonly known as the Grenet battery is very convenient. 3. I have an old style phonograph for which I am unable to get any suitable tin foil (12 square feet per pound). I have been to several foil manufacturers, but what they have is either too thin or too heavy. Can you tell me where I can get the right kind, also by what name is it known? The last that I used is called "sand blast foil," but it seems altogether too stiff. A. By going directly to the tinfoil manufacturers you can get any grade of foil you want. Some of the dealers who call themselves manufacturers do not really make the article.

(2617) Reader asks: In the simple electric motor is it necessary to have the wire on the twelve coils wound even, provided all the coils have the same length? If so, what is the reason? A. It is advisable to wind the wire as compactly as possible, on account of making the space between the armatnre and field magnet as small as possible. A motor will operate with more or less efficiency, whether the wire is wound evenly or not.

(2618) A. F. writes: Can you tell me if the piece of metal I sent you is the same as non-magnetic watch movements are made of, and if all of said metal will draw steel filings, if left on a magnet for a few hours, as this sample does? This is a piece of shield sold as non-magnetic, but it is attracted by the magnet. A. The metal you send is nothing but iron. As a magnetic shield it is the only serviceable metal. For non-magnetic work iron, on the other hand, must be rigorously excluded. The conditions in the two cases are exactly opposite. The metal best suited for a magnetic shield is the worst for non-magnetic movements.

(2619) W. L. R. asks what to add to the ordinary starch paste to make it permanent. I make it of a little water and common gloss starch, for mounting pictures, but it dries in about eight days. A. You must keep it in a tightly closed vessel. If it did not dry, it would be useless. See SCIENTIFIC AMERICAN, October 11, 1890, page 227, and also November 1, 1890, page 281, for pastes.

(2620) H. H. writes: 1. Will shaving cause pimples on the face of a young man in good health? A. It should not. 2. What will cure the same? A. Wash with a solution of Rochelle salts in water. 3. I find that bisulphate of mercury will make a silver-like polish on brass. Will this polish last? A. It will destroy the brass and will rapidly deteriorate. It should never be used.

(2621) P. M. asks what the musical artists use on their hands to make the sound when they play on musical glasses, tumblers partly filled with water. A. Powdered resin may be applied to the finger tips to give a greater "bite" upon the glasses.

(2622) C. H. R. asks: 1. In what number of the SCIENTIFIC AMERICAN can I find a description of the Stiletto? A. We refer you to the SCIENTIFIC AMERICAN of June 20, 1885, and of May 4, 1890. The latter article describes her as altered into a torpedo boat. 2. What is the rate of speed in miles attained by the speediest ocean steamers? A. From 23 to 25 miles an hour. 3. Would it be possible to attain same speed in a 50 or 60 foot boat built on approved speed lines by using specially designed engines? A. Yes, but only by using very high power.

(2623) B. R. B. writes: Will you inform me what is meant by dyeing on cotton mordanted as for the alizarine test? Would it not do to pass the cotton through a solution of alum to which soda ash has been added? A. For an alizarine mordant on cotton use a bath of 24 parts alum and 6 parts gray tartar for 100 parts of cotton. Boil for two hours, steep for twelve hours and dry for a day. With 8 parts alizarine, an equal weight of sumac, ½ part flavine and 2 parts chalk may be used. Add the alizarine last. Many other mordant formulas may be used. Your mordant would doubtless answer. We can supply excellent works on dyeing, such as Bird's "American Practical Dyer's Companion," price $10.

(2624) R. C. asks: What would be the effect of using an alternating current dynamo in connection with a storage battery? A. Practically no result would be reached. An alternating current does produce certain electrolytic effects, but it would not answer for charging a storage battery.

(2625) H. W. A. writes: I have a plaster cast, which from age and careless usage has become discolored. Is there any way in which it can be restored to its original whiteness? A. Only by painting or calcimining. A thin wash of plaster of Paris and water might answer.

(2626) M. T. asks: 1. Can parchment paper be sized? A. It can be sized, but the parchmentizing process renders it so impervious that sizing is not needed. 2. What is it used for? A. It is used largely for covering jars of pickles, bottles of liquids, etc., by stretching and tying over the corks. It can be bought of different qualities.

(2627) J. H. M. asks: 1. Is there any freezing mixture that retains its coolness permanently? A. No. 2. What one retains its coolness longest? A. Of ordinary substances, ice.

(2628) C. H. M. asks: 1. What will dissolve aniline color or dye, besides alcohol? A. Water dissolves most aniline colors. 2. Will you give me a receipt for making black and colored inks? A. For inks we refer you to our SUPPLEMENT, No. 157. 3. A good mucilage. A. For mucilage use a solution of gum arabic in water flavored with a little oil of cloves.

(2629) W. H. asks: What treatment is necessary to extract tannin from new oak vessels in order to prepare them for the storage of wine? A. The tannin can be extracted by solution in water, or can be precipitated by washing the barrels with a solution of 1 pound sulphate of iron and 3 pounds sulphuric acid, followed by thorough washing out with water. Or rinse out with 4 gallons water and 6 ounces sulphuric acid and wash thoroughly.

(2630) H. S. B. asks if anything can be done to soften rubber mackintoshes, silk finish, when they have become stiff and hard. A. Probably nothing effectual. Try sponging with ammonia.

(2631) W. E. S. asks for the ingredients and manner of making sticky fly paper. A. Sticky fly paper may be coated with one of the following mixtures: *a.* Resin 9 parts, rapeseed oil 4 parts. *b.* Resin 8 parts, turpentine 4 parts, rapeseed oil 4 parts, honey ½ part. *c.* Resin 1 pound, molasses 3½ ounces, linseed oil 3½ ounces, boil until thick enough.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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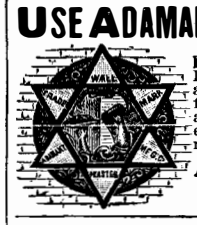

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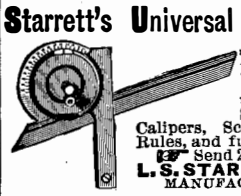

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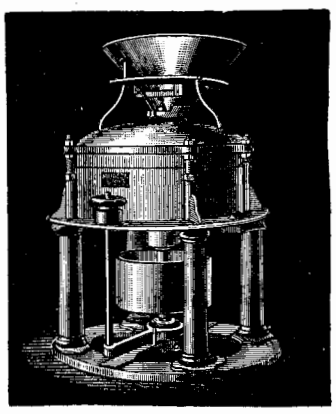

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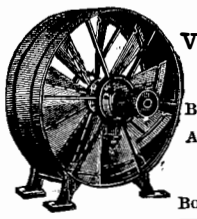

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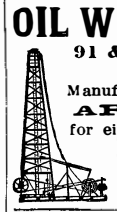

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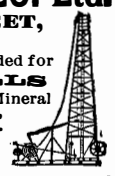

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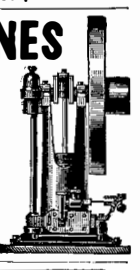

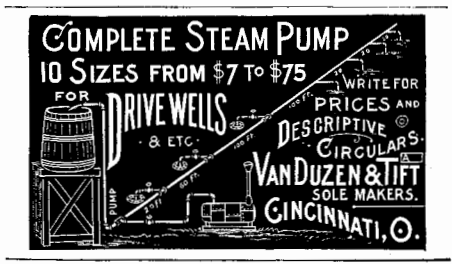
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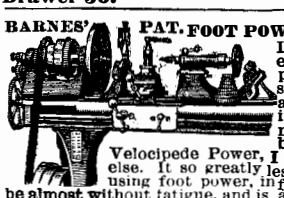

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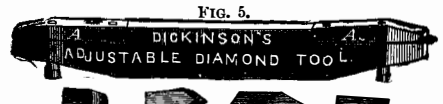

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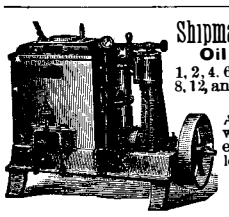

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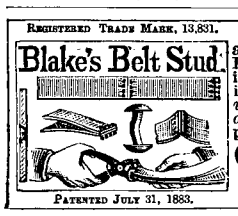

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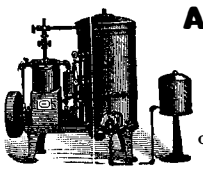

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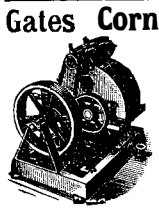

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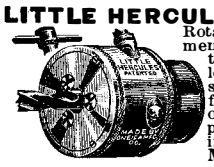

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Proposals will be received by the undersigned at their office in Jeddo, Luzerne Co., Pa., until January 1, 1891, for driving two Tunnels (one designated as Tunnel "A", the other as Tunnel "B") and sinking a Slope and Airway. Said Tunnel "A" to be constructed from Butler Valley, Butler Township, Luzerne Co., Pa., to near the bottom of Ebervale Mammoth Vein Slope No. 2. **The size of Tunnel "A" to be eight (8) feet by eight (8) feet in the clear and about three (3) miles long.** Said Tunnel "B" to be constructed, in a vein underlying the Mammoth vein, from the bottom of proposed Slope to a point opposite Jeddo No. 4 Slope, and about right angles from this point to near the bottom of Jeddo Mammoth Vein Slope No. 4. **The size of Tunnel "B" to be five (5) feet by six (6) feet in the clear and about one and seven-tenths (1 7-10) miles long.** Contractors for Tunnels will name a price per lineal yard in **each Tunnel** for Rock, for Shale, for Slate, for Coal, and for Earth. The Slope and Airway will be sunk on a vein underlying the Mammoth Vein at Ebervale, Luzerne Co., Pa. **The size of the Slope to be nine (9) feet by seven (7) feet above the rail, and about one thousand (1,000) feet long. The size of the Airway to be five (5) feet by five (5) feet and about one thousand (1,000) feet long.** Contractors for the Slope and for the Airway will name a price per lineal yard **in each** for Rock, for Shale, for Slate, for Coal, and for Earth. Tunnel "A" to be driven with three headings, two from bottom of proposed Slope, the other from the surface in Butler Valley. Butler Valley heading will be driven so the water will run from the Tunnel as the work proceeds. Tunnel "B" to be driven from bottom of proposed Slope with one heading. The material excavated and the water from Tunnel "A" and Tunnel "B" headings at bottom of proposed Slope will have to be taken out proposed Slope by the contractors. Contractors will be required to do the work in a good workmanlike manner, to timber as may be required, to carry brattice for air or ventilate by pipes, to prosecute the work at each heading and Slope with one, two, or three shifts of men as we may direct, to furnish air-compressors, two air drills for each heading, and all other machinery, boilers, rails, sills, motive power, lumber timber, and tools necessary for a speedy completion of the Tunnels. Contractors will state the date they would begin operations, and the time they will complete the Tunnels. Bonds are to be given for a faithful performance of the work in a specified time. The right is reserved to reject part or all of the proposals. Further information can be obtained by calling or addressing
JNO. MARKLE, *President, Jeddo Tunnel Co., Limited,*
Jeddo, Luzerne Co., Penna.
November 24, 1890.

U. S. Engineer Office, Room 90, 134 Van Buren Street, Chicago, Illinois. November 24, 1890.—Sealed proposals in triplicate, for rebuilding superstructure over 5,243 feet, more or less, of breakwaters in Chicago Harbor, Illinois, will be received at this office until 12 o'clock, noon, Saturday, December 13, 1890, and opened immediately thereafter in the presence of bidders. Proposals will be accompanied by a guarantee that if the bid be accepted, contract will be entered into within ten days after notice of acceptance. The United States reserves the right to reject any or all bids. The attention of bidders is invited to the acts of Congress approved February 26, 1885, and February 23, 1887, Vol. 23, p. 332, and Vol. 24, p. 414, Statutes at Large. Preference will be given to articles of domestic production or manufacture, conditions of quality and price (including in the price of foreign articles the duty thereon) being equal. No contract will be awarded for furnishing foreign articles when the domestic article of suitable quality can be obtained. For specifications, blank proposals, and all other information, apply at above address to
W. L. MARSHALL, *Capt. Corps of Engineers, U. S. A.*

U. S. Engineer Office, St. Augustine, Fla. November 26, 1890.—Notice is hereby given that on the 27th day of December, 1890, at 12 o'clock, noon, standard time, I will sell at Mayport, Fla., for cash, to the highest bidder, the wreckage from the bark "Neva," consisting of about 35 cords (more or less) of logwood. The logwood is apparently in good condition. It is in sticks from 4 to 5½ feet long, and from 3 inches to 20 inches in diameter. The wood must be removed within 30 days from sale, and until removed will be at owner's risk. For further information apply to this office.
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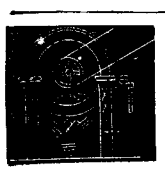

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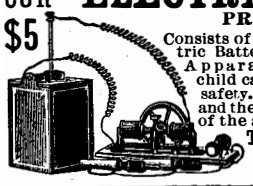

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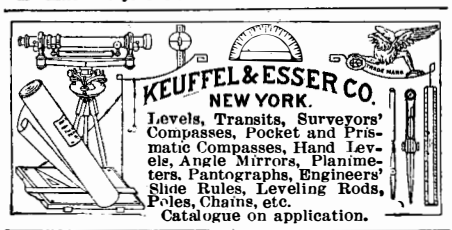

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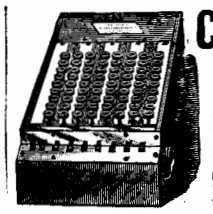

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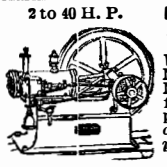

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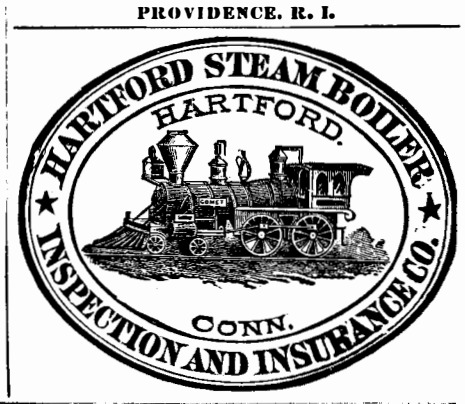

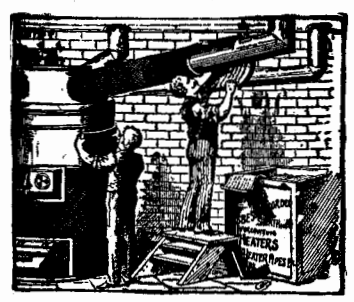

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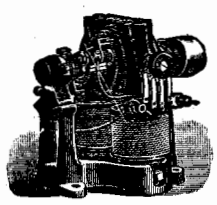

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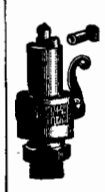

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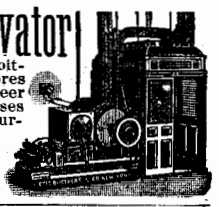

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